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The Role of Networking in Innovation in an Emerging Economy: The Case of Russia

By

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Abstract

This study aims to expand the existing knowledge of the role of networking in innovation. It focuses on Russia, a country with a transition economy. On the governmental level, the lack of understanding of the networking mechanisms that Russian start-ups use to support their innovation creates a barrier to effective decision making related to the development of the national innovation system. On the start-up level, this lack of understanding hampers the ability to select effective networking strategies aimed at ensuring that companies can achieve their aims in each stage of their development. In order to determine the scope of opportunities for companies to establish external relationships and to set the context for the interpretation of the primary data, the author conducts a detailed analysis of the evolution of Russia's national innovation system. The investigation is based on secondary data, including official government documents, articles, and publications in the scientific literature and newspapers. To gain a deeper understanding of the interrelationship between networking and innovation, the study investigates the networking behaviour of Russian SMEs, represented by a sample of 59 companies that launched business activities in Moscow between 2009 and 2017. To collect primary data, in-depth interviews were carried out with the founders of these companies. To conduct a comparative analysis of networking behaviour of companies with different degrees of innovativeness, entrepreneurial ventures in the sample are grouped into four innovativeness categories: very low, low, medium and high. The findings confirm the key proposition that innovative start-ups are more actively engaged in networking and have wider networks. In addition, the study shows that more innovative start-ups build and govern their networks of business contacts differently than less innovative start-ups. Finally, the author discusses implications for the development of theory and practice, reflects on the limitations of the research, and makes suggestions for future research on innovative networking that might build upon this study. A key contribution of this DBA thesis to practice emerged in the sphere of the author’s teaching and administrative activities at the Lomonosov Moscow State University Business School. The results of this study were utilised in the construction and implementation of an educational project (February-April 2018) in which students worked closely with technological start-ups to help them establish vital contacts in their business and market environments. Therefore, the knowledge obtained from this study was taught to students and applied in practice in the implementation of a systematic approach to the search for and expansion of contact networks conducive to innovation. As such, it helped students develop networking skills and assisted start-ups in successfully solving tasks related to the commercialisation of innovative products and services.

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Introduction

Research problem

In this study, innovation is viewed as a process that results in the creation and introduction of a completely new or significantly improved offering or customer experience on the market. The study focuses on investigating the networking behaviour of entrepreneurs that is conducive to establishing a company and launching a product or service on the market.

Given the relatively recent emergence of entrepreneurship as a phenomenon in Russia, there are no established, recognised or proven approaches to running one's own business or to building relationships and networks supportive of such a business. Extant literature indicates that entrepreneurs view networking as a mechanism that can compensate for scarce resources and structural holes in business models. In addition, a diverse network can serve as a means of social-capital creation, which in turn can provide entrepreneurs with the information, moral support and expertise needed to overcome the difficulties associated with building a business, especially if those difficulties are exacerbated by the high degree of uncertainty inherent in emerging markets, such as Russia. As innovative entrepreneurship is the most complex and indeterminate form of entrepreneurship, it can be proposed that the greater a start-up's innovativeness, the more entrepreneurs are likely to be engaged in networking and the wider their networks should be.

The focal research problem arises from the fact that despite the existence of an updated innovation infrastructure in Russia, the country's national innovation system (NIS) is inefficient – it does not contribute to increasing the number of innovative companies or lead to the introduction of significant amount of new, high-tech products. In the context of an ineffective NIS, personal ties can create the mechanisms necessary for innovative development and have the potential to compensate for institutional deficiencies in the innovation environment. As networking may become the driver of Russia's innovative development in the near future, it is important to understand its mechanisms, including the approaches used to build and govern networks. In order to achieve a detailed understanding of networking behaviour and its relationship with start-ups' innovativeness, this study offers a comparative analysis of the networking features of companies exhibiting different degrees of innovation.

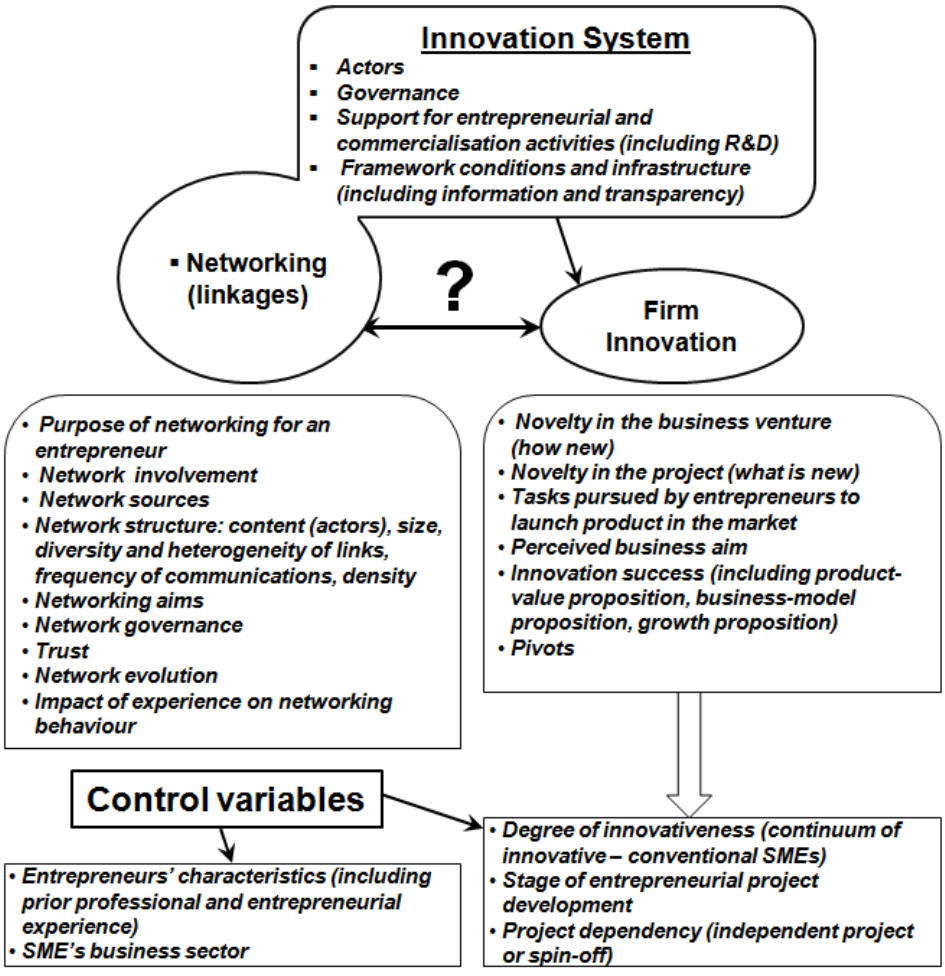
The literature on innovation and networking in modern Russia is scarce. There is no contemporary understanding of how Russian firms establish external relations to enhance their innovativeness, even though there is a widespread trend of studying this issue among

European researchers. Thus, this study aims to extend the extant literature by addressing the role of networking in founding and developing an innovative company in a context of Russia. From a practical point of view, this study aims to identify patterns of networking behaviour among modern Russian start-ups and highlight the approaches that are most useful in terms of their ability to help companies perform their tasks in the best way.

Research design

The aim of this study is to ***examine the role of networking in innovation among Russian entrepreneurs***. Since this implies achieving a deep understanding of entrepreneur's networking behaviour, the study is exploratory in nature. That is, the task is to provide qualitative empirical evidence of interrelationship between firms' innovativeness and their networking activities, rather than to quantitatively identify the existence of a causal relationship between these phenomena. Given that networking is an integral part of the innovation system, the conceptual framework adopted in this study and developed on the basis of a literature review can be visually represented as shown in Figure 0.1.

Figure 0.1. The conceptual framework of the study



Source: Developed by the author

To achieve the aim of this study, it is necessary to conduct complex research consisting of two parts. The first part is devoted to the analysis of Russia's NIS development, and understanding of Moscow's regional innovation system (RIS) features, thereby establishing a context for interpreting entrepreneurs' networking behaviour. The second part, based on the collection and analysis of primary data gathered from interviews with Moscow-based entrepreneurs, covers the specifics of their networking behaviour. The study uses the following research questions, which emerged from the study of the literature and the identification of key themes related to networking, to build an understanding of the networking behaviours of Russian start-ups that are supportive of innovation (see Table 0.1).

Table 0.1. Research questions

Part 1 **Documentary study**	▪ How did each of the five stages of the Russian NIS development affect the benefits, opportunities, costs and risks of creating networks supportive of innovation?
Part 2 **Qualitative research**	▪ RQ1: What role does networking (external relationships) play in the founding and development of businesses in the Russian context in relation to their degree of innovativeness? ▪ RQ2: In terms of an entrepreneurial venture's development, how does the network of relationships evolve over time? ▪ RQ3: What role does trust play in building a business relationship? ▪ RQ4: Does networking behaviour evolve as entrepreneurial experience increases?

Source: Developed by the author

DBA thesis structure

The DBA thesis consists of four chapters that contribute to the study's logic as shown in the Table 0.2.

Table 0.2. The study's logic

Research phase	Contribution to the study's logic
Literature review (Chapter 1)	Considered the three fundamental areas – innovation, networking, NIS. The concepts revealed in the literature determined the author's understanding and allowed for formation of a conceptual apparatus that included the key analytical categories used as the basis for the analysis performed in Chapters 2 and 3.
Documentary study (Chapter 2)	Based on the analysis of the documents, five phases of the Russian NIS's development were identified. The specific features of the Russian NIS were considered, which served as the context for studying the role of networking in innovation. The current state of the Moscow RIS was analysed and conclusion made that Moscow had all necessary elements of a regional innovation system. Consequently, it was an excellent context for studying the behaviour of SMEs in terms of networking with RIS participants.
Qualitative research (Chapter 3)	Based on the study's design (the author's approach to the formation of innovation categories) and the collected qualitative data, conclusions were made about the existence of different patterns in the behaviours of various groups of Moscow-based entrepreneurs.
Contribution of the research (Chapter 4)	On the basis of the findings, conclusions were drawn on how cognitive frameworks should change with regard to entreneurial networking and its role in innovations.

	A practical-oriented learning project was developed to enable students to assist start-ups in the development of innovations. This study's limitations were considred and recommendations were made for further research.

Source: Developed by the author

Chapter 1 is devoted to elaborating the theoretical and conceptual underpinnings of the study via a critical evaluation of the relevant extant literature. The chapter is structured around key dimensions of the research area, such as innovation, networking and national innovation system.

Chapter 2 provides a detailed analysis of the trajectory of NIS development and evolution of state policies supporting entrepreneurship and innovation in Russia over the past 26 years and considers Moscow's regional innovation system (RIS) features. This creates a context for understanding innovation and networking trends in the modern Russian economy, including the scope of opportunities the entrepreneurial and innovation infrastructure provides to Russian start-ups for establishing external relations. This chapter considers the features of NIS development in each phase, especially relevant achievements and areas of inefficiency in Russia's innovative system. A key historical feature of the development of the Russian NIS is that the innovation concept has been interpreted almost exclusively in the context of technological entrepreneurship. Therefore, the Russian innovation infrastructure has been built in such a way as to create opportunities for the emergence and development of highly technological start-ups. This distinguishing feature explains the decision to focus on companies engaged in the commercialisation of technologies in a product or service to study their networking behaviour in SME's high and medium innovativeness categories.

Chapter 3 consists of the primary research, which contributes to our understanding of the role of networking in the development of innovative organisations. It starts from justification of the approach for grouping start-ups for further study, and presents the results of the analysis of the collected data for each of the research questions. Discussions and findings from the literature reviewed in Chapter 1 are integrated to develop the research questions. Epistemological, ontological and philosophical stances lead to the choice of research strategy – the grounded theory approach, which is seen as the most appropriate for undertaking this interpretive study of the role of networking in innovation. Given the high context richness, the conclusions derived from the data analysis are justified using statements made by those participating in the study. Chapter 3 ends with a discussion of the implications for state innovation policy. It also offers a set of conclusions that highlights the evolution of approaches to networking among Russian entrepreneurs,

including the conclusion that these approaches are similar to Western norms, and compares those conclusions to the extant literature.

Chapter 4 explains the study's contributions by comparing the findings with ideas about innovation networking found in the literature. In light of the study's findings, a suggestion is made to supplement the existing cognitive frameworks of entrepreneurial networking behaviour with considerations of the innovativeness of those networks, as the behaviours of entrepreneurs in various groups differ. This chapter also shows how the knowledge built and systematised in this study can be applied in practice by discussing its use in the implementation of a course at the Business School[1] at which the author of this thesis works as an Associate Professor. The aim of the course was to provide students with the knowledge and practical skills needed to effectively build networks through the implementation of a real project. The key project task was to apply a systematic approach to identifying the contacts needed by innovative start-ups and to provide assistance in establishing links with those contacts. The project was carried out in February-April 2017 by student groups and five innovative start-ups from the innovation development institution known as Skolkovo Foundation. At the end of the chapter, the limitations of the research presented in this thesis were discussed and recommendations were provided on how future research on innovation-related networking might build upon this study's findings.

[1] Lomonosov Moscow State University Business School, Moscow, Russia.

Chapter 1. Literature Review and Conceptual Framework

The chapter aims to build a context for interpreting and understanding the research results by reviewing the extant scholarly literature, and identifying relevant concepts and theories, thereby placing the current study into the broad domain of knowledge in the field of innovation and networking. The primary purposes of this chapter are, first, to establish the theoretical foundations for the development of the conceptual framework used in this study, including the definitions of the key concepts and the identification of their relevance for the research dimensions and, second, to discover gaps in the extant knowledge that the current study can begin to address.

1.1. Innovation

This section presents a review of scholarly research and an analysis of the concept of innovation with a focus on how innovation manifests itself in entrepreneurial organisations. The ultimate aims of this section in the context of the current study are to build a conceptual understanding of innovation, to identify aspects of innovation that can determine the occurrence of various networking patterns and to uncover the dimensions (control variables) that are important for evaluating the effect of networking on innovation.

The section begins with a discussion of extant views on innovation as an outcome, a process and a strategy. It then proceeds to a discussion of distinctions among types of innovation, an explanation of the link between entrepreneurship and innovation, consideration of stages of innovative-enterprise development, and an explanation of the nonlinear nature of innovation. Logics and approaches to managing innovation in knowledge- and technology-driven enterprises for which the innovative process is the key to success are considered at the end of the section.

1.1.1. Theoretical underpinnings of innovation

The extant literature considers innovation as a multifaceted phenomenon. As such, it is viewed as an outcome, process or strategy, the pursuit of which results in the emergence of new managerial functions, such as innovation management.

Innovation as an outcome

Some authors (Rogers, 1983; Johannessen et al., 2001) suggest that “novelty” is a major defining characteristic of the innovation phenomenon. In this perspective, innovation is a product, service, method of production, market, source of supply or way of organising (Schumpeter, 2004, p. 66) that the adopting unit perceives as new. An innovative outcome involves the successful application of new ideas, which result from innovation processes

that combine various resources to provide added value and a degree of novelty (McFadzean et al., 2005; Dodgson et al., 2014). Ideas that give rise to innovations do not always stem from technological inventions or discoveries. Notably, ideas often emerge from the intersection of extant knowledge with a new need or an unresolved problem. Thus, innovation can be the result of modifications resulting from interactions between people and their knowledge, as embodied in products, processes or services (Roberts, 2007; Bjork and Magnusson, 2009).

According to Slappendel (1996), the perception of newness is essential, as it differentiates innovation from improvement. Innovation is often perceived as the result of an invention being developed into something new to the market that is then exploited economically (Schumpeter, 2004). However, "innovation" is not equal to "invention". Schumpeter (2004, liv) declares that innovation is possible even in the absence of invention and that invention does not necessarily lead to innovation. West (1992) proposes that in order to understand innovation, we must focus on commercial viability and competitiveness in the marketplace rather than on intellectual perceptions within an organisation of an innovation's value as a novelty. Roberts (2007, p. 36) declares that "innovation is composed of two parts: the generation of an idea or invention and the conversion of that invention into a business or other useful application". Frederiksen and Knudsen (2017) claim that after development and market introduction, a new product's adoption (or rejection) by recipients will affect the extent of commercialisation and, eventually, its performance. Consequently, innovation should be viewed as the outcome of the commercialisation of some ideas or approaches that are perceived as new. In this perspective, novelty in itself is not the ultimate purpose. It is needed to capture the attention of potential recipients of a new offering. If potential users do not view the novelty as useful, then they may not adopt the new product (Frederiksen and Knudsen, 2017) and its newness to the company on an internal level will have no value.

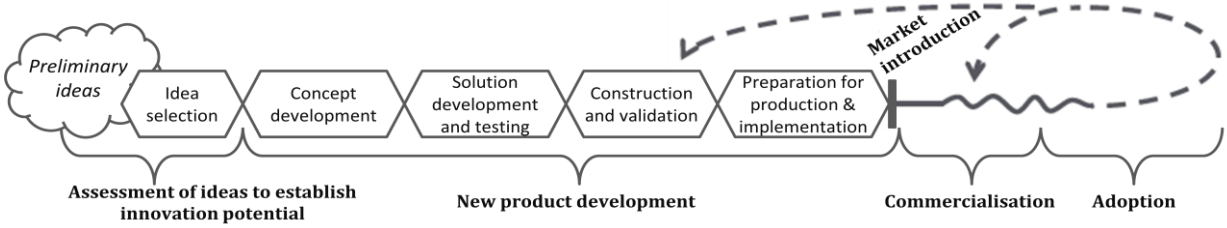
Given the view that the commercialisation of some ideas or approaches is primarily a result of a firm's activities (Roberts, 2007), it is worthwhile to consider the typology of innovation outcomes. This is because different types of innovation and their implementation may require different networking behaviours.

Innovation as a process

Another trend in the literature is to model innovation not as an outcome but as a process or as a sequence of actions that usually starts with a discovery and ends with activities that differ in terms of their level of success and their diffusion (e.g., Drazin and Schoonhoven, 1996). In this regard, innovation is seen as the process of implementing creative and

sometimes scientific or knowledge-intensive ideas (Crossan and Apaydin, 2010). This process has several phases, including preliminary idea generation (often driven by an attempt to solve a customer problem identified in the market), idea selection, and elaboration, until the idea successfully reaches the market as a product or service produced by an organisation (Deschamps, 1995; Frederiksen and Knudsen, 2017). Figure 1.1 illustrates the stages of innovation process that focus on transforming knowledge into products that will be viable in the marketplace. The need to adapt products to clients' requirements to improve their perceived value may require the organisation to implement changes in marketing and sales activities, or to re-design its offering.

Figure 1.1. Stages of the innovation process



Source: Frederiksen and Knudsen, 2017, p. 6

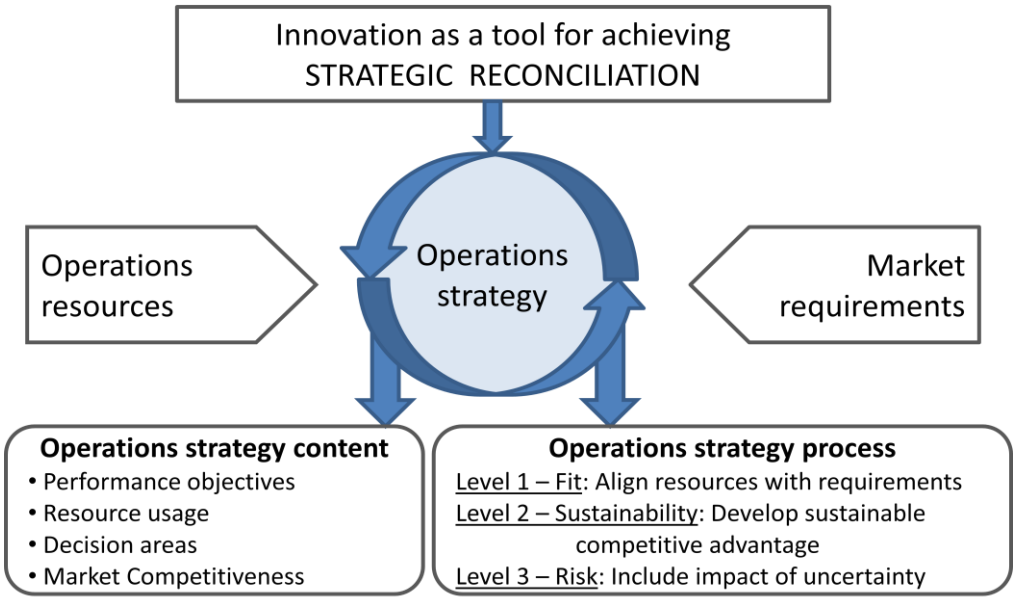
To consider innovation as a process, it is necessary to understand the actions that are necessary to ensure the transformation of knowledge into a product that will be welcomed by the market. Claiming that new idea or technological solution commercialisation outside an organisation is impossible (Crossan and Apaydin, 2010; Dodgson et al., 2014), innovation implementation can be modelled as an entrepreneurial process that is simultaneously a continuous and impulsive series of actions that leads to business development. The inputs in this process include innovative ideas, resources, complementary competencies, and entrepreneurial skills and qualities, while participation in the competitive process is the main output (Smallbone and Welter, 2009). In light of the novelty and uncertainty that are integral characteristics of the innovation process, companies may lack the necessary competencies and resources. However, access to these elements can be facilitated by networks. In order to determine the network behaviours that can contribute to innovation, it is necessary to investigate the stages of the innovation process and related management tasks that may require external assistance, and to build an understanding of the general logic of the managerial activities behind the commercialisation process.

Innovation as a strategy

In the modern knowledge economy (Powell and Snellman, 2004), which is characterised by an accelerated pace of technical and scientific advancement, rapid obsolescence, and

increased global competition, an innovative approach is generally recognised as a more promising strategy than cost-based competition (Utterback and Abernathy, 1975; Drazin and Schoonhoven, 1996; Dundon, 2002; Asheim et al., 2003). Furthermore, innovation is sometimes perceived as an instrument for either adapting to rapid change in the marketplace or for aggressively influencing the environment (Damanpour, 1996). Thus, innovation can be seen as a source of competitive advantage for companies seeking to meet market requirements and thereby achieve market success (the market-based view), as well as those attempting to outperform competitors by building effective strategies and operations (the resource-based view). In other words, innovation can be perceived as tool for achieving strategic reconciliation between market requirements and operational resources, as commercialisation ultimately requires implementation of an operations strategy that ensures market fit and sustainability. The strategy must also encompass an ability to manage risks (Slack and Lewis, 2002; see Figure 1.2).

Figure 1.2. Strategic reconciliation through innovation



Source: adapted from Slack and Lewis, 2002, p. 39

An analysis of the scholarly literature shows that the understanding of innovation's strategic role, and the mechanisms of its implementation and management have evolved and changed along with the general approaches to business management, which have attempted to match the evolution of economic relations and structures. Rothwell (1994) and others (e.g., Nobelius, 2004) describe this evolution in six generations of innovation models (see Appendix 2). Each stage was characterised by different drivers and a certain level of economic development, which determined the innovation challenges, and directed innovative thinking with regard to innovation outcomes and innovation-management approaches. In this respect, the newly developed innovative model constituted a best

practice at each stage. The Table 1.1 visualises the evolution of innovation models in line with economic developments and managerial perspectives.

Table 1.1. Evolution of innovation models and managerial focus to address the driving mechanisms of economic development

Generation	First (1G) Technology push (1950s – mid-1960s)	Second (2G) Market (pull) (mid-1960s – early 1970s)	Third (3G) Coupling model (early 1970s – mid-1980s)	Fourth (4G) Integrated innovation process (mid-1980s – early 1990s)	Fifth (5G) Systems integration and networking (early 1990s – early 2000s)	Sixth (6G) Multi-technology cross-industry networking (early 2000s – present)
Driving mechanisms	Technological opportunities; production economy; productivity as a key priority	Demand-side factors; meeting customers' needs; service economy	Interaction between technological potential and market needs; efficiency; consumption economy	Shortening of the product life cycle and the speed of development; time-based competition and a need to be a "fast innovator"	Information technologies; emergence of knowledge economy; need for greater flexibility and adaptability; competition based on faster development speed and greater efficiency	Multi-technology nature of new products; digital economy; increase in R&D complexity to pull together expertise from different industries; multiple aspects entangled and multiple actors collaborate
Managerial perspective	Classical approach (scientific management, administrative management)	Human-resource approach (human-resource management, organisational behaviour, physiology)	Quantitative approach (management science, operations management, customer behaviour)	Systems perspective (people in organisations, resource-based view, strategic management theories of competitive advantage, change management, competence and innovation theory)	Contingency approach (knowledge management, learning and creativity, strategic management based on co-opetition and collaborative advantage, evolution of competence and innovation theory)	Information-technology approach (impact of IT and the Internet on organisational behaviour, technology and knowledge management, supply chain management, networking, collaboration)

Source: adapted from Rothwell, 1G – 5G, 1994; Nobelius, 6G, 2004; Raduan et al., 2009; DuBrin, 2010

In the Table 1.1, the field of management thought embraces the managerial approaches traced by researchers in organisations' practises. In that respect, the development of management theories in the table above should be perceived as dynamic in nature. In other words, although managerial perspectives or approaches are shown as developing along a linear trajectory, their interactions and linkages are not necessarily chronological. Moreover, their relationships are shaped by the environmental needs and relativity of the structural and operational requirements of particular organisations acting within certain industries (Raduan et al., 2009). Although best practices are continually evolving, Rothwell (1994) claims that reality is more complex. Different companies with different approaches operate simultaneously and they conduct their business in various ways that means that all innovation models can co-exist in various forms (Rothwell, 1994). Rothwell

(1994) proposes that opportunities for innovation may simultaneously arise from market pull (new needs), technology push (new inventions), or knowledge flows through the complex set of relationships (networking) among actors within and across industries. Moreover, the involvement of companies in a particular industry determines its innovative model to some extent. For example, firms in the pharmaceutical (science-based) and chemical (process-based) sectors are more likely to implement the technology pull model, while successful, innovative manufacturing firms are likely to adopt a fifth-generation model. When the majority of organisations in a particular industry realise the benefits of new approaches, the old approaches become obsolete, as their application will hinder organisational development. In today's knowledge economy, the organic parts of the fourth-, fifth- and sixth-generation models are networking and the key innovation strategy is integration of innovative partners' activities on their organisations' strategic and operational levels.

1.1.2. Types of innovation

In order to build the conceptual understanding of innovation to be used in the current study, it is necessary to determine the categories of innovation. Innovation typologies have been constructed in various ways in the extant literature, which extensively addresses the questions of where, by whom, and under which circumstances innovative ideas are generated (van de Ven, 1986; Bjork and Magnusson, 2009; Johnson, 2011). The current study uses the approach suggested by Johannessen et al. (2001) in which a typology is created using the following questions: What is new? To whom is it new? How new is it?

What is new?

In the classical approach (Schumpeter, 2004), types of innovation are defined in relation to innovation outcomes. These outcomes include the development of new products or services, the development of new methods of production, the identification of new markets, the discovery of new sources of supply and the development of new organisational forms.

Numerous studies focus on a few main areas that determine the dimensions of innovation in an organisation (Evan and Black, 1967; Daft, 1978; Damanpour, 1996; OECD, 2005; Adams et al., 2006; Liao et al., 2008; Armbruster et al., 2008; Tavassoli and Karlsson, 2015). Definitions of key dimensions highlighted by these authors are provided in Table 1.2.

Table 1.2. Types of innovation

Innovation type	Refers to
Product or services	The introduction of new goods or services with new characteristics or new intended uses.
Process	Significant changes in methods of producing or delivering goods, or creating or providing services (e.g., inputs, operations, task specifications, work and information flows), or the introduction of new elements into those methods.
Technological	Changes in the technology or equipment used to produce products or render services.
Organisational	Changes in organisational structures or administrative procedures, or the implementation of new organisational methods, practices or programmes that affect organisational members. Examples of such innovations include (Tavassoli and Karlsson, 2015): – Introduction and implementation of new strategies, – Introduction of knowledge-management systems that improve skills in searching, adopting, sharing, coding, storing and diffusing knowledge among employees, – Introduction of new administrative and control systems and processes, – Introduction of new internal authority and leadership structures with associated incentive structures, including decentralised decision making and teamwork (e.g., self-managed teams), – Introduction of new types of external relations with other firms and/or public organisations, including, vertical cooperation with suppliers and/or customers, alliances, partnerships, sub-contracting, outsourcing and offshoring, and – Introduction of new personnel-recruitment policies for key positions.
Marketing	Changes in marketing instruments or the implementation of new marketing methods (e.g., "changes in product design and packaging, in product promotion and placement, and in methods for pricing goods and services" (OECD, 2005, p. 17)). Marketing innovations relate to the opening up of new markets or the positioning of a product in a new way on the market.

Although the definitions of product, market and process innovations used by different authors appear to be quite similar, the complex phenomenon of organisational innovation is interpreted in various ways. For example, Wang and Ahmed (2004) identify two organisational innovation dimensions: behaviour and strategic innovation. The former refers to a novelty introduced into organisational routines at the individual, teams or management level. The latter is understood as a fundamental re-conceptualisation of the business model. Tavassoli and Karlsson (2015) add that organisational innovation involves changes in routines aimed at improving the efficiency, productivity, profitability, flexibility and creativity of a firm using disembodied knowledge. Organisational innovations can be structural or procedural, and intra-organisational or inter-organisational (Armbruster et al., 2008). They serve as "fertile ground" for innovation, especially for process innovations (Tavassoli and Karlsson, 2015, p. 1890), as they can reduce the tensions within an organisation in its efforts to adopt a new technology. Hollen et al. (2013) propose that organisational and process innovations become intertwined over time, and reason that although technological process innovation is rooted in technological problem solving, it must be broadly integrated with other organisational processes.

Tavassoli and Karlsson (2015) declare that organisational innovations are distinct from product innovations. They can be supportive of each other, as the introduction of knowledge-management systems and incentive structures can foster new product development in existing organisations. However, organisational innovations are not a prerequisite for product innovations. This is particularly true for technological start-ups in which entrepreneurs are primarily focused on product development, such that they build the new company's organisational structure and procedures in parallel (Aulet, 2013).

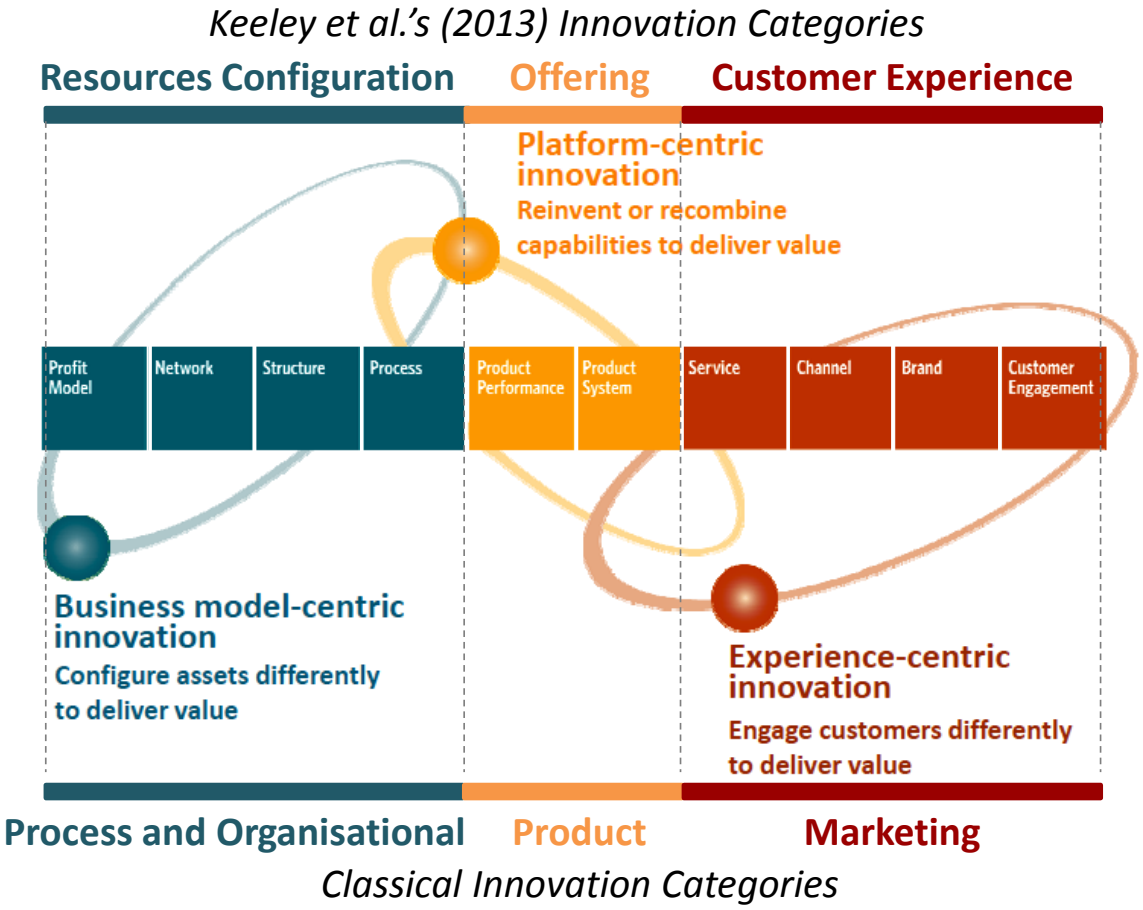
An analysis of the literature leads to the conclusion that various types of innovation may be implemented together, and that they thereby reinforce each other and contribute to the firm's performance and competitiveness. The intensity of a firm's engagement in various types of innovation depends on the stage of the firm's lifecycle (Damanpour, 1996; Drazin and Schoonhoven, 1996). In the early stages of development, such as when the firm is an entrepreneurial start-up, it mainly relies on product and marketing innovation. As it grows and becomes more complex, the firm initiates process innovation (Utterback and Abernathy, 1975). As a firm approaches maturity, it requires more complex, investment-demanding innovations, such as technological and organisational innovations. Notably, Damanpour (1996) provides empirical evidence that managers perceive technological innovations as relatively more advantageous than purely organisational innovations.

In order to build a data-collection instrument, it is important to be able to distinguish among types of innovation in borderline cases. With respect to technological and process innovations, the borders are blurred because the introduction of new technologies instantly leads to changes in the process. In the third edition of its manual *Guidelines for collecting and interpreting innovation data*, the OECD removed the word "technological" and defined broader boundaries for process innovations as follows: "A process innovation is the implementation of a new or significantly improved production or delivery method. This includes significant changes in techniques, equipment and/or software" (OECD, 2005, p. 49). On the basis of experience gained from several rounds of innovation surveys, the OECD decided to include four types of innovation in its definition: product, process, organisational and marketing (OECD, 2005, p. 47).

Another evidence-based methodology for developing innovation categories is suggested by Keeley et al. (2013). Building on their understanding of innovation as the *creation* of a *viable new offering*, the authors propose three major innovation categories: resource configuration, offering and customer experience. They then break these into ten subcategories of innovation (see Figure 1.3). The configuration types of innovation are focused on the innermost workings of an enterprise and its business system. Offering types of innovation are focused on an enterprise's core product or service, or a collection of its

products and services. Experience types of innovation are focused on the more customer-facing elements of an enterprise and its business system.

Figure 1.3. Ten types of innovation



Source: Keeley et al., 2013

Although the upper-level categories can generally be mapped onto the classical typology described above (as shown in the Figure 1.3), the composition of the ten suggested types of innovation constitutes a shift from a product-centred view to a market-centred view, which reflects the shift from a product-based economy to a consumption-based economy. In addition, the configuration types account for new realities brought to life by phenomena associated with the information economy (Shapiro and Varian, 1999) and the related network economy (Ard-Pieter de Man, 2004). The experience types suggested by Keeley et al. (2013) can also be used to understand innovative ideas emerging in the realm of the sharing economy (Puschmann and Alt, 2016) that are associated with a change in client behaviour due to social networks, electronic markets, the use of mobile devices and the reliance on electronic services. Keeley et al.'s (2013) typology of innovation extends the field of focus, which previously centred on the product as the sole offering. It explicitly includes the concept of services that either create innovative value for a customer or add value to a more tangible product. In other words, it reflects the fact that people rarely

consume products in today's world. Instead, they consume product systems that comprise both products and services.

When summarising their study of nearly 2,000 examples of innovative behaviour, Keeley et al. (2013) declare that innovation rarely fails due to a lack of creativity. Rather, most failures are caused by a lack of a comprehensive understanding of the essence of innovation and a failure to think actions through. The authors believe that the most certain way to fail is to focus only on products. Successful innovators consciously use many types of innovation simultaneously, and their decisions rely, at the very least, on the identification of market opportunities for the offering and on analyses of innovation patterns in the industry. The latter is important, as an entrepreneur should make informed decisions not only about the type of innovation he or she wants to pursue but also about the degree of newness needed to successfully position the business in the competitive landscape.

New to whom?

The analysis of the literature shows little consensus on how the newness of innovation should be considered. Most frequently, the literature relies on the following categories for understanding the newness of innovation: new to the adopting unit (a firm), new to the industry and new to the consumer (Johannessen et al., 2001). Garcia and Calantone (2002) suggest supplementing the list with the categories of new to the world and new to a particular market (place) in order to capture the perspective of international business. They also suggest inclusion of a new to the scientific community category, which stresses that the discovery of a new technology may spur a new wave of technological innovation.

Although this approach creates intersecting clusters, it is still useful to determine the minimum requirements that must be met if a development is to be considered an innovation. In accordance with the OECD's (2005) approach, this study views a development as an innovation if it is at least new to the firm. Thus, this study's definition of innovation includes fundamental innovations that are new to the industry as well as significant improvements, even if the firm borrows or adapts ideas and technologies that exist elsewhere (Slappendel, 1996). As discussed in the previous section, the adaptation and continued development of solutions introduced by others constitutes a significant proportion of innovative activity among firms. Therefore, this understanding of innovation is consistent with the objectives of this study.

How new?

The degree of newness is frequently used as a measure of innovativeness. Products are perceived as highly innovative if they are believed to have a high degree of newness. Products with a low level of newness are located at the opposite end of the continuum (Garcia and Calantone, 2002).

Damanpour (1991) suggests classifying innovations according to the degree of change they cause in a firm. He defines radical innovations as those that produce fundamental changes in the activities of an adopting organisation and constitute a significant departure from past practices (Damanpour, 1991). Radical innovations introduce a new way of doing business (Henderson and Clark, 1990), while incremental innovations are those that result in a lesser degree of departure from existing practices. Incremental innovations are related to better exploitation of business solutions and result in variation, design improvements, refinement of routines and instrumental innovations. Radical innovations are perceived as more original, difficult, costly, complex and uncertain, although they are not necessarily more technologically sophisticated (Utterback and Abernathy, 1975). They often suggest novel applications that will open up new markets or significantly increase the potential of existing markets (Henderson and Clark, 1990). Empirical results reported by Ettlie and Rubenstein (1987) suggest that large firms with greater resources are more likely to commercialise radical innovations. At the same time, medium-sized firms have the potential for radical product introductions if they resolve critical funding and research problems (Ettlie and Rubenstein, 1987).

As discussed above, radical innovations are new to the firm, new to the market and often new to the industry. They can serve as the basis for the successful entry of new firms or even the reinvention of an industry. As radical innovations are often related to discoveries, they are more likely to be protected by patents. The invention of the combustion engine and the new business models introduced by Skype and Amazon.com are examples of such industry-changing innovations.

While incremental innovations are perceived as new to the firm, they may have been previously used by other companies (Johannessen et al., 2001). They often aim at improving customer satisfaction and enhancing firm productivity. As Dundon (2002) states, systematic incremental innovations are as valuable, if not more valuable, as breakthrough innovations because they constitute the basis for the continuous development of firms and the evolution of best practices in industries.

The literature (e.g., Starbuck, 2014) suggests that radical innovations are associated with a high degree of risk – as they remove constraints and utilize resources that had been hidden,

they may lead to products that the market might not perceive as useful. Radical innovations forces firms to draw on new technical and commercial skills, and to employ new problem-solving approaches (Henderson and Clark, 1990). Starbuck (2014) says that social interactions can stimulate, reinforce and steer radical innovation. Social networking may be useful for freeing up creativity and pre-testing ideas. In addition, networks can provide moral support, and several creative people can attract attention and resources beyond the reach of the individual entrepreneur. However, social interactions can also impede innovation by freezing behaviours and perceptions in outdated patterns.

Henderson and Clark (1990) argue that the *radical – incremental* continuum is not enough for studying existing innovative practices. They suggest the following framework for defining types of innovation in relation to their newness (Figure 1.4).

Figure 1.4. Framework for defining innovation (Henderson and Clark, 1990)

Linkages between core concepts and components	Core Concepts: Reinforced	Core Concepts: Overturned
Unchanged	*Incremental innovation*	*Modular innovation*
Changed	*Architectural innovation*	*Radical innovation*

Source: Henderson and Clark, 1990

Henderson and Clark (1990) suggest including a dimension that focuses on the way in which the components of an offering are linked together. They therefore add two new categories of innovation: architectural and modular. If a core design concept (and, thus, the basic knowledge underlying the product components) is untouched but the way in which the components are linked is changed, it is an architectural innovation. In that sense, Uber's business model is an architectural innovation rather than a radical innovation. Modular innovations are those in which the core design concepts of a technology are changed, although the basic structure of linkages within the product's architecture remains the same. For example, one can simply replace an analogue dialling device with a digital service.

Although radical innovations are more visible to an outsider than other types of innovation, they occur much less frequently. As radical innovations require intensive scientific and engineering involvement, they often emerge in start-ups founded by existing organisations for the purpose of discovery commercialisation (i.e., within a framework of intrapreneurship rather than entrepreneurship). Presumably, the other types of innovations

can be found in start-ups launched by either independent entrepreneurs or corporate intrapreneurs. In relation to the current study, different levels of intended newness of innovations are likely to require different networking patterns.

1.1.3. The link between entrepreneurship and innovation

In terms of innovation implementation, Schumpeter (2004) assigns the most significant role to entrepreneurship given its inseparable and embedded innovative nature. He describes an entrepreneur as innovator who is able to implement an idea and create new markets, new methods of production, new products and new organisational methods (Heertje, 2006, p. 25). Most definitions of entrepreneurship agree that the term refers to certain individual behaviours, including initiative taking, creative thinking, and the organisation of social and economic mechanisms in a way that turns resources and situations into practical outcomes, thereby creating greater value (Gutterman, 2012). Entrepreneurs accept risk and a high probability of failure (Hisrich, 1990) in their attempts to create something new (Hessels, 2008) or to establish new ventures owned and managed by interested individuals (Gartner, 1990; Gutterman, 2012). Gartner (1990) adds that entrepreneurship involves the creation of new organisations with the intent of ensuring their growth. Davidsson et al. (2006) defines the concept of entrepreneurship as the creation of a new economic activity, which can occur through the formation of new enterprises or new viable projects within established firms.

Notably, the extant literature offers no consensus about whether "innovative entrepreneurship" refers to a specific type of business (e.g., Filley and Aldag, 1978; Aulet, 2013) or only to the initial stages of new business development (e.g., Scott and Bruce, 1978; Hanks et al., 1993), especially inception and survival (Scott and Bruce, 1978) which the literature refers to as the start-up stages (e.g., Hanks et al., 1993).

Some authors (Filley and Aldag, 1978; Aulet, 2013) argue that innovative enterprises should be considered as distinct research objects, as they are launched, developed and managed differently than conventional SMEs (see the distinctive features summarised in Appendix 1), which do not necessarily need innovation to be successful. Building on Roberts' (2007, p. 36) proposed formula of "innovation = invention + exploitation", Aulet (2013) suggests differentiating between two concepts: "innovation-driven entrepreneurship" (the creation of "innovation-driven enterprises", or IDEs) and "small business entrepreneurship" (the creation of "small and medium-sized enterprises", or SMEs). The former are primarily focused on the first part of the formula – "invention" – while understanding that the main aim is the commercialisation of new ideas or inventions. Innovation is viewed as a clear competitive advantage, as it enables the firm to bring new

solutions to customers and to target global opportunities, thereby achieving high growth. As innovations are frequently based on new technologies, the literature often refers to IDEs as technology-driven (or technological) start-up firms. In other words, IDEs aim to implement technologies in the market. In contrast, SMEs are focused on the second part of the formula – "exploitation". They do not view new ideas or technologies as prerequisites for establishment, growth or competitive advantage, as they target the exploitation of available resources in order to satisfy the needs of the existing, usually local, market. Examples of this type of firm include restaurants, dry cleaners and firms active in the service industry.

As conventional businesses use pre-existing, proven models (usually without significant adaptations), they are unlikely to have certain stages in their development that are typical for technological start-ups, such as a research and development (R&D) stage, and a stage focused on the creation of a prototype and a minimum viable product (MVP). Due to the absence of these stages, the uncertainty for traditional SMEs is lower, costs are more easily estimated and fewer initial investments are required to bring the offering to the market. The drawback of the traditional approach can be the presence of a large number of players on the market with similar offering and, as a result, intense competition.

Based on the suggestion that the creation of a new economic activity can be realised through the creation of new independent enterprises and new projects within established firms (Davidsson et al., 2006), the extant literature distinguishes between two concepts: entrepreneur and intrapreneur. The former is usually described as one who organises, manages and assumes the risks of a business or enterprise launched for the purpose of idea commercialisation (Luchsinger and Bagby, 1987). Definitions of intrapreneur generally refer to one who is responsible for the initiation and implementation of innovative systems and practices within an existing, usually large, company with which an intrapreneur shares risks. The purpose of these activities is to improve the organisation's economic performance by more effectively utilising its resources (Hisrich, 1990; Luchsinger and Bagby, 2001; Maier and Pop Zenovia, 2011). The idea of intrapreneurship lies in the view that in order to remain competitive and dynamic, established players must reinvent themselves to allow at least a part of the business to behave as if it were an entrepreneurial start-up (Galavan et al., 2008).

According to Hisrich (1990), intrapreneurs' characteristics often lay between those of traditional managers and entrepreneurs. A literature analysis allows for the main distinctive traits of traditional managers, intrapreneurs and entrepreneurs to be summarized. This summarization highlights the deficiencies in their behaviours and lays ground for their explanation (see Table 1.3).

Table 1.3. Comparison of traditional managers, intrapreneurs and entrepreneurs

Trait	Traditional managers	Intrapreneurs	Entrepreneurs
Primary motives	Promotion and other traditional corporate rewards, such as remuneration package, office, staff and power; focused on activities and processes.	Independence and ability to advance in the corporate setting receiving the corporate rewards; motivated by interest in problem solving and effecting change.	Independence, opportunity to create, self-actualisation and achievement; more motivated by achievement than by money
Source of support and motivation	Support and incentives provided by the organisation; mostly external sources of motivation.	Administrative and operational support provided by the organisation, although incentives are tied to the endeavour's success; combination of external and internal sources of motivation.	Perfect support system not ready to use, but should be built by an entrepreneur or chosen from those offered in the ecosystem, often at the cost of partial ownership transfer; mostly internal sources of motivation.
Time orientation	Short-run: meeting quotas and budgets; weekly, monthly, quarterly and annual planning horizons.	Depends on urgency to meet self-imposed and corporate timetables.	Survival and achieving 5- to 10-year growth of business.
Setting and activities	Operates in the context of an organisation; delegates and supervises more than direct involvement.	Operates within the setting of an organisation with structural and procedural constraints; direct involvement in operations more than delegation; stimulates group innovation.	Independent; provides own setting; direct involvement; relies on teamwork.
Risk ownership	Organisation	Shared: organisation and intrapreneur	Entrepreneur
Risk attitude	Cautious	Moderate risk taker	Higher risk taker; ability to make decisions under uncertainty
Status	Concerned about status symbols.	Not concerned about traditional corporate status symbols; desires independence.	Not concerned about status symbols; status is less important than self-realisation.
Attitude toward failures and mistakes	Tries to avoid mistakes and surprises.	Attempts to hide risky projects from view until ready.	Deals with mistakes and failures.
Control and decisions	Limited control within a designated area; strict accountability to upper manager; usually agrees with those in upper management.	Responsibility for the project's outcome; partial control; strict accountability to organisation that is a sponsor or equity partner; need to follow organisational bureaucracy; able to convince others to help achieve a dream.	Full control over internal environment and establishment of connections with external environment; follows a dream with own decisions and attracts followers.
Who serves	Upper managers, shareholders, customers	Self, customers, sponsors	Self, customers, team (followers)
Relationships with others	Within-organisation relationships based on a hierarchy; external relationships usually along value chain	Expects key relationships to stem from corporate network; supplements those relationships with	Actively looks for external contacts; diverse network; combination of contractual and informal

	(customers, suppliers, partners); relationships often formalised and approved by upper managers	personal contacts; tends to establish contractual relations; seeks approval of established relations in accordance with organisational procedures; prefers establishing business-to-business relations.	relations; transactions and deal making as a basis of relationship; prefers establishing person-to-business relations; often powered by informal interactions, including those through social media (social networks).

Source: adapted from Hisrich, 1990; Luchsinger and Bagby, 2001; Parker, 2011; Fischer and Reuber, 2011

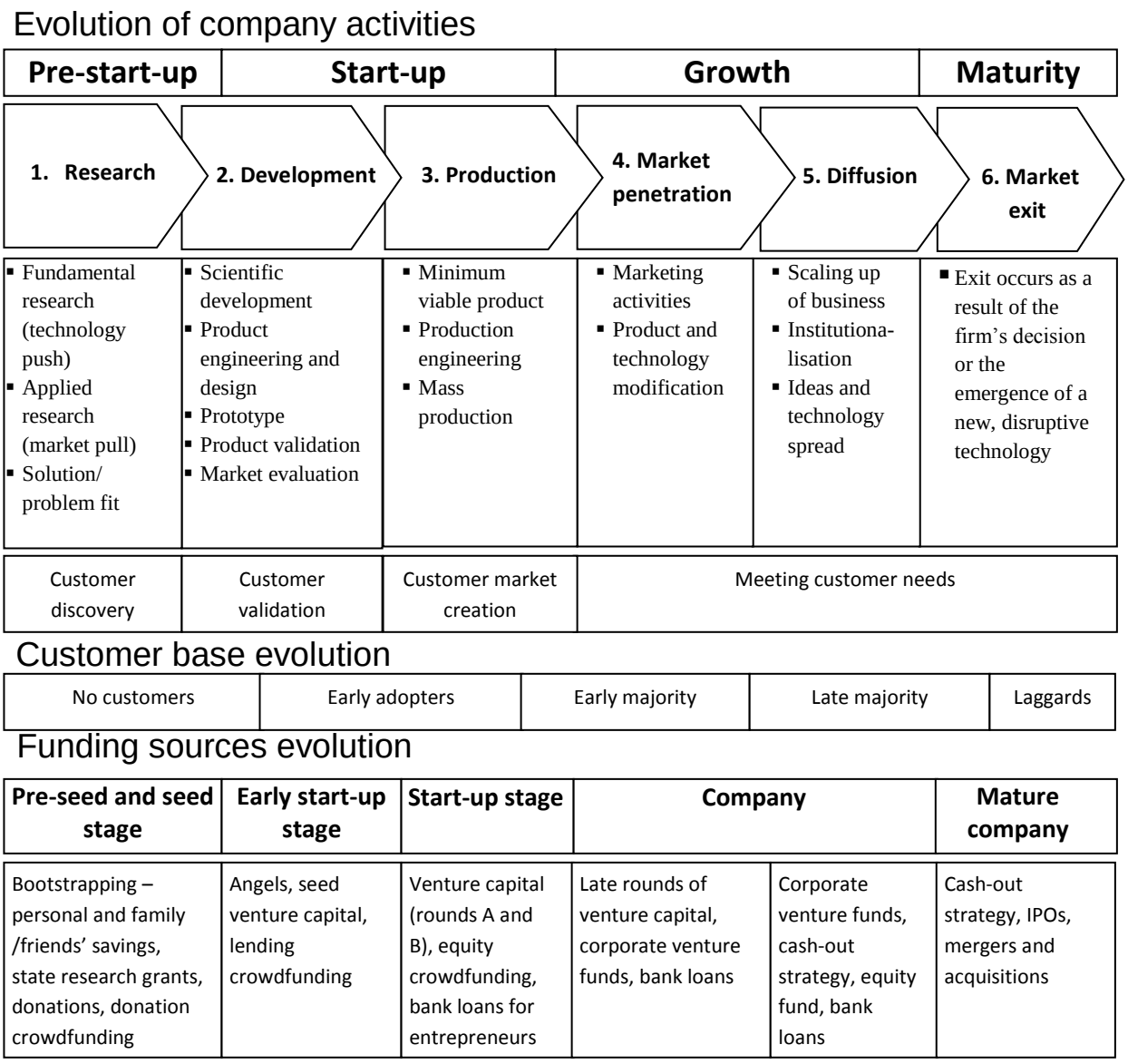
Table 1.3 shows that intrapreneurs demonstrate a more entrepreneurial mind-set than traditional managers. Similar to entrepreneurs, they strive for independence and self-realisation, and they actively search for new opportunities and new contacts to assist in problem solving. However, like traditional managers, they are willing to rely on corporate resources. On the one hand, this creates economies of learning and allows them to build on know-how developed as a result of the parent organisation's experience. On the other hand, they are obliged to follow corporate requirements and procedures, as an organisational sponsor or equity partner requires strict accountability. These constraints affect behaviour, decision making, choice of strategies in innovation-implementation processes and associated networking patterns.

1.1.4. Stages of innovative start-up development

The trajectory of the entrepreneurial process from nascence to maturity has been studied by many authors. These authors have modelled that process from different perspectives depending on the focus of their research: entrepreneurial activities related to product development in an organisation (e.g., Rothwell, 1994; McFadzean et.al., 2005; Shaw et al., 2005; Brem 2008; Barancheev et al., 2009), market and customer-base development (e.g., Blank, 2007; Overall and Wise, 2015), and funding activities (e.g., Lerner et al., 2012; Paschen, 2016). These three dimensions are interrelated – in order to undertake activities needed to commercialise an idea and develop a product, an organisation needs to find funding sources. At the same time, the organisation should test the viability of the product in the market at an early stage, and stimulate demand through marketing efforts in order to ensure market penetration and sales growth and, thereby, recover investments in the later stages.

An analysis of the extant literature allows for the stages found in these three perspectives to be mapped against each other. As such, it enables the building of a more comprehensive representation of the entire entrepreneurial process, which starts with an idea, goes through the commercialisation stage, and moves on to the growth and maturity of the firm (see Figure 1.5).

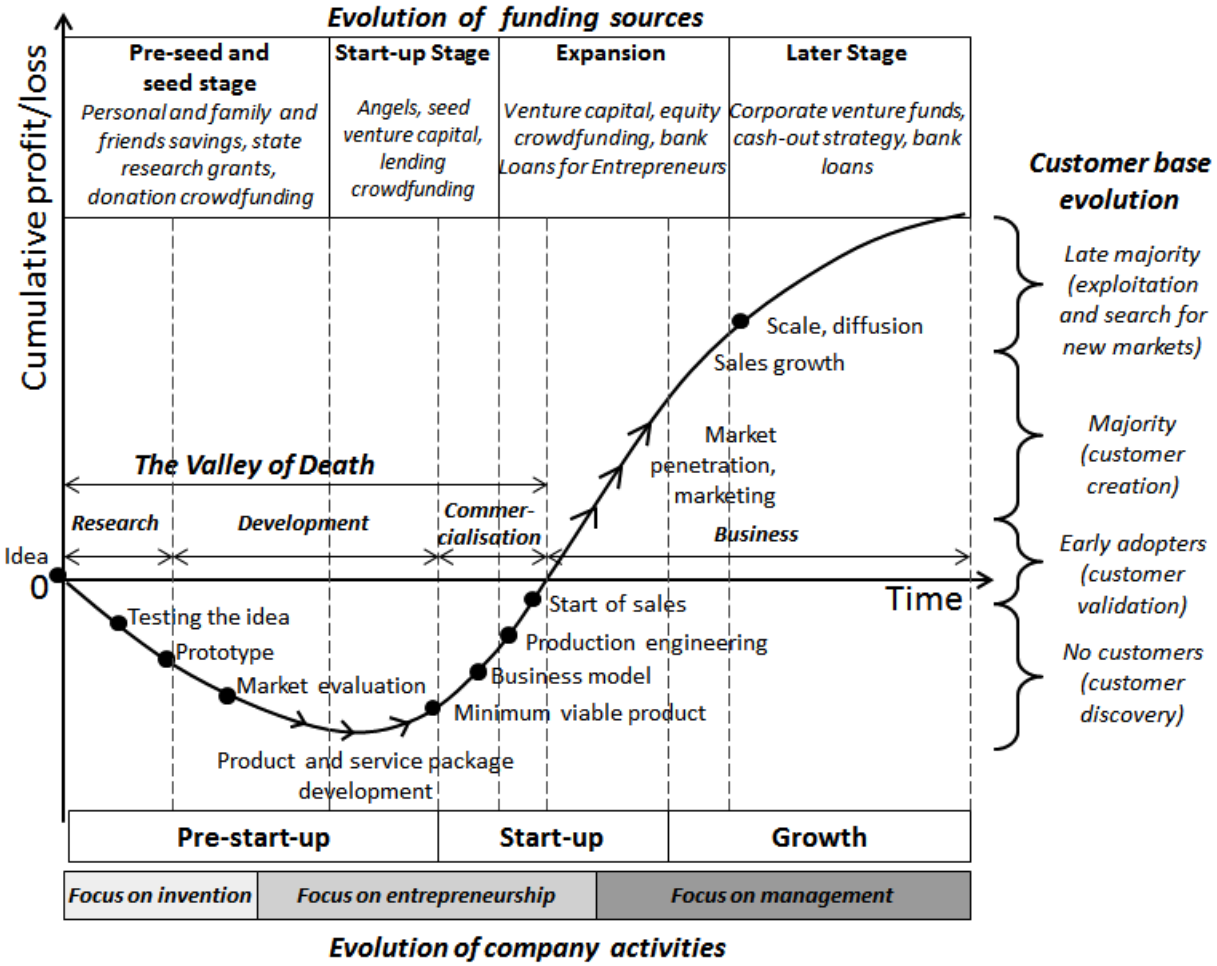
Figure 1.5. Stepwise model of innovative entrepreneurial organisation development



Source: developed by the author using Barancheev et al., 2009; Lerner et al., 2012; Blank, 2013; Overall and Wise, 2015; Paschen, 2016

Although the stepwise model in 0 is shown as a linear trajectory, many authors point out that innovation-related processes follow an S-curve path over time. This can be said about product life cycle, innovation diffusion and the associated company performance cycle (Overall and Wise, 2015; Graham, 2000), and about the entrepreneurial-experience and venture-performance curves (Toft-Kehler et al., 2013). Figure 1.6, which illustrates this view, maps entrepreneurial activities, funding and customer-base evolution along the S-curve.

Figure 1.6. Entrepreneurial organisation life cycle



Source: developed by the author using Catlin and Matthews, 2001; Lerner et al., 2012; Blank, 2013; Toft-Kehler et al., 2013; Overall and Wise, 2015

Overall and Wise (2015, p. 23) suggest that the life-cycle theory found in biology is useful for understanding how products, innovations and businesses evolve over time as endeavours develop from young start-ups into well-established firms. This view offers numerous insights into the holistic understanding of entrepreneurial behaviour.

In the early stages of research and development (R&D), the uncertainties related to technology development and its viability in the market testing are at their highest. This is the most difficult period in the development of a start-up and, like small children, start-ups need help. At the same time, the unpredictability of the outcome (in terms of the commercial success of the business) limits the possibility of attracting investments. This forces an entrepreneur to follow the bootstrapping strategy, which results in a significant reliance on 3F sources of finance ("family, friends, fools"; Reddi and Gerard, 2012). The lack of financial resources makes it impossible to pay for professional advisory or management services, which leaves start-ups to survive on their own in the "valley of

death" (Acland, 2011; Barr et al., 2009; Markham et al., 2010). Advisory services are mostly needed in relation to exploring technology development or transfer opportunities, and for industry and market understanding. Such services are essential for successfully completing the R&D stage. In the commercialisation stage, which is associated with the conversion of technical solutions into a product, management professional services are needed. In particular, they are helpful for developing a business model, preparing a business plan and presentation for potential investors, establishing a company, building operations, and hiring qualified staff. To cross the "valley of death" and start a profit-generating business, entrepreneurs need not only advice, information and resources, but also moral encouragement, skills, knowledge and managerial experience, all of which are often scarce (Hisrich, 1990).

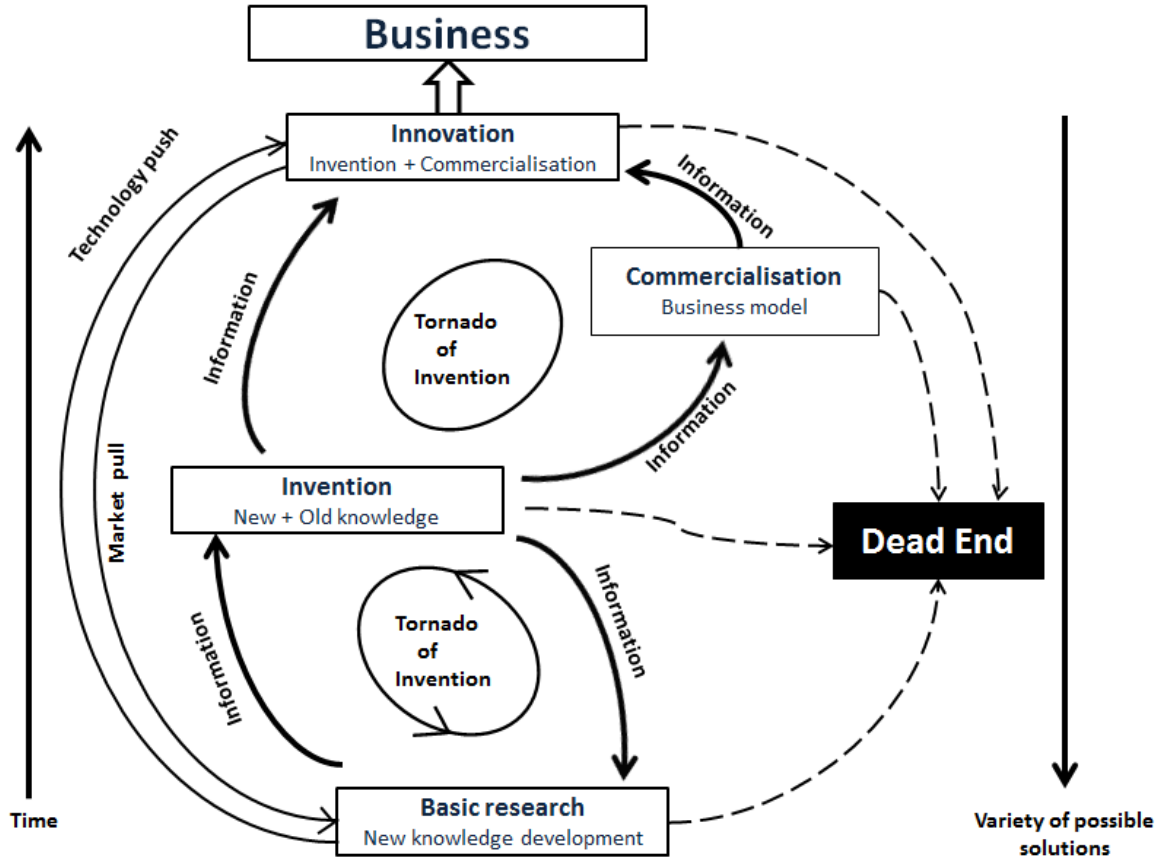
The literature suggests that a strong situational determinant in the development of a new venture is the density of the entrepreneur's business contacts or linkages (Hisrich, 1990). Entrepreneurs view networking as a mechanism that can compensate for scarce resources and structural holes in business models (Aarstad et al., 2009; Anderson et al., 2010). Respondents in the extant research viewed the building of a diverse support network as a means of social-capital creation that enabled them to obtain the information, moral support and expertise needed to overcome difficulties, improve the efficiency with which sparse resources were used and, in some cases, obtain such resources at no cost.

Roberts's formula (2007, p. 36) implies that most innovation takes place in the incubation period of a new company's development when it is in the "valley of death" and preparing to launch its product in the market. As Schoen et al. (2005) stress, this is a highly turbulent period in a company's life cycle. Innovation is essentially a non-linear process. It starts from research that is fundamentally about new knowledge creation and is punctuated by occasional flashes of insight that lead to new discoveries that can be neither predicted nor scheduled to arrive at a particular time (Chesbrough, 2006). Moreover, there is no guarantee against failure, which might result in the termination of the project (a dead end). Innovation then goes through the interrelated stages of invention (i.e., development of idea into a product) and commercialisation (i.e., introduction of the product to the market). This interrelation, which must ensure a good match between the product idea and a viable business concept, results in "hither and thither" operations in which linear thinking and acting are disturbed by the "tornado of invention" (Schoen et al., 2005).

Thus, the innovation cycle, at least within the "valley of death", should be seen not as stage-by-stage S-curve but rather as a multiple-spiral model that includes spiral elements

for invention and commercialisation processes, as well as technology push and market pull forces that should be perceived as acting simultaneously. Schoen et al. (2005) conclude that the innovation process includes an element of randomness that adds uncertainty to the risk that the endeavour will fail as a result of unskilful implementation. In that respect, expertise in different phases of the invention/innovation process obtained through experience is more useful than a purely theoretical understanding of innovation models. The non-linearity of the innovation cycle is visualised in the Figure 1.7.

Figure 1.7. Innovation cycle within the "valley of death"



Source: adapted from Schoen et al., 2005

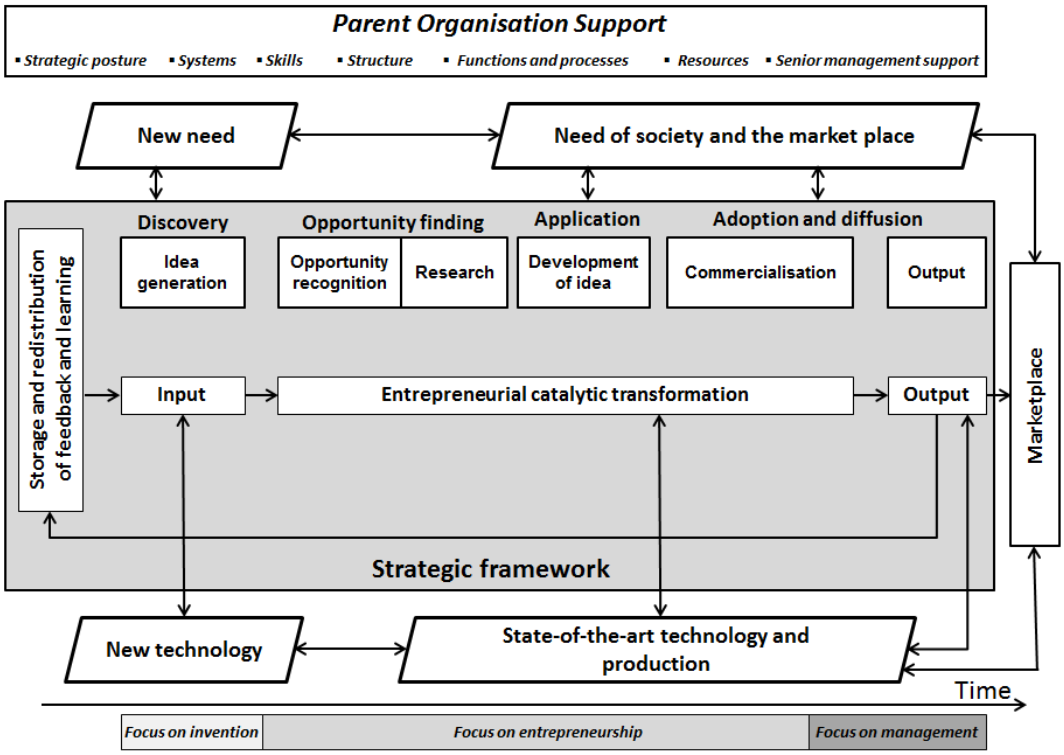
In elaborating on the concept of innovation nonlinearity, Galavan et al. (2008, p. 166) declare that an iterative loop contains four types of discussions: "make sense, make choices, make it happen, make revisions (sense anomalies and revise key assumptions)". The strategy loop is simple in theory but unstructured and messy in practice. Therefore, the implementation of conventional managerial techniques used in traditional management settings may be insufficient. Thus, a framework to support analysis, discussions and decision making is required to help managers act on new information that arises in the course of the innovation process. Managers can put this approach into practice through formal and informal discussions (Galavan et al., 2008) that result from networking.

Collaborative learning from networks gives rise to intellectual capital that is particularly important for innovation in the knowledge economy (Tushman and Anderson, 2004). Thus, an understanding of the systems and procedures developed by entrepreneurs for managing the acquisition, transfer and application of knowledge, as well as the role of networking in innovation management constitute the primary interests of the current study.

Given Schoen et al.'s (2005) reasoning that experience is important, start-up novices and serial entrepreneurs should be expected to behave differently. A number of studies supporting this supposition are found in the literature. For example, Aarstad et al. (2015) find that start-up novices attract fewer resources than experienced portfolio entrepreneurs. Their research shows that novice technological entrepreneurs are anchored in technological side of innovation, and that they struggle to prioritise the business activities that are critical in the "valley of death" phase, such as building intra- and cross industry relationships (supply side), and exploring market opportunities (demand side) to implement commercialisation. Although attracting financial resources and professional advice is perceived as valuable, novices are unwilling to compromise on ownership control or to disclose business secrets. Portfolio entrepreneurs, on the other hand, acknowledge that technology might have little value if the relevant market actors are not found and convinced (Aarstad et al., 2015). As a result, "they proactively aim to establish business relations early in the process. They emphasise that a major lesson [is] to avoid developing excessive attachment to the product but to be willing to share the risks and profits with other industry and market actors" (Aarstad et al., 2015, p. 89). The key implication is that previous entrepreneurial experience influences the process of acquiring resources. This research also proves that novices and portfolio entrepreneurs differ in relation to mind-sets, behaviours, and strategies in the entrepreneurial process.

Given that experience matters, entrepreneurs and intrapreneurs can also be expected to behave differently, as the latter are backed up by the expertise of the parent organisation. McFadzean et al. (2005) and Shaw et al. (2005) offer a model of the intrapreneurial organisation life cycle, as shown in the Figure 1.8.

Figure 1.8. Intrapreneurial organisation life cycle



Source: adapted from McFadzean et al., 2005, and Shaw et al., 2005

A comparison of the main stages of the intrapreneurial and entrepreneurial processes (see Figure 1.5) reveals several similarities. Interestingly, technological solutions and ideas developed as a result of an organisation's innovation activities are perceived as starting points for new entrepreneurial endeavours. Accumulated experience from previous innovation rounds is fed into the system as input for a new venture. In that respect, an intrapreneur's behaviour should be similar to that of a portfolio entrepreneur who builds on his previous experience. However, McFadzean et al. (2005) point out that although an intrapreneur might have an advantage compared to an entrepreneur in terms of resources, skills acquisition and ready-to-use networks provided by the parent organisation, he or she might also have a serious disadvantage in the form of organisational bureaucracy and culture. The latter factors may affect the intrapreneur's attitudes and ability to make independent entrepreneurial decisions and, as result, influence the behaviour and strategies chosen in the entrepreneurial process.

1.1.5. Logic of innovation management

The analysis of the extant literature allows for the identification of several different views on innovation management. The resource-based view models innovation as a project that has certain inputs, time constraints and desired results (outputs). In this regard, innovation

can be considered within the theoretical domain of *project management* (Gemünden et al., 2013). This approach was inherited from the 1950s when pioneering organisations developed new structures, techniques and processes to create high-value complex products based on research and development endeavours rather than market needs (Rothwell, 1994). Organisations use project approaches to create novel products, processes and services; develop new technologies; launch entrepreneurial ventures; implement strategies; and produce complex infrastructure (Davies, 2014).

However, innovation implementation is accompanied by uncertainty (Tatikonda and Rosenthal, 2000) that is not well captured in a linear "define goals, plan, manage, check" approach to projects. Some authors suggest that conventional project-management practices, very useful in the context of conventional businesses, lead to the failure of innovation-deployment projects (Shenhar and Dvir, 2007; Kapsali, 2011), and that the formality of project management amplifies complexity and uncertainty. Thus, authors considering innovation from the market-based view have increasingly interwoven the concepts of innovation and market uncertainty (Frederiksen and Knudsen, 2017) when modelling innovation processes. Ries (2011, p. 9) says that the first trap that can lead to the failure of a start-up is

> "the allure of a good plan, a solid strategy, and thorough market research. In earlier eras, these things were indicators of likely success. The overwhelming temptation is to apply them to start-ups too, but this doesn't work, because start-ups operate with too much uncertainty. Start-ups do not yet know who their customer is or what their product should be".

However, this does not imply that entrepreneurial activities should not be managed. Ries (2011, p. 8) claims that "a start-up is an institution, not just a product, and so it requires a new kind of management specifically geared to its context of extreme uncertainty".

Some of the literature, especially the stream that focuses on questions of intrapreneurship (e.g., Catlin and Matthews, 2001), relates the concept of innovation to the changes it entails for an organisation in relation to its technology, administrative processes (Damanpour, 1996), operations and internal practices. In other words, it focuses on new ways of doing things in order to improve efficiency and effectiveness (van Dijk et al., 2011). Increasingly, researchers propose that the innovation process is uncertain and non-standardised that may give rise to conflicting demands, and lead to contradictory practices and competing views within the organisation that may activate or hinder innovation performance. In the case of intrapreneurship, this is because innovation introduces new elements into the organisation's internal routines. In the case of entrepreneurship, these

developments are mostly due to the path-dependent behaviours and different cultural and professional attitudes of start-up team members (Acland, 2011). In that sense, innovation management is increasingly modelled through the lenses of *change management* (Ritala, 2013). Galavan et al. (2008, p. 164) emphasise that the implementation of innovation follows an iterative approach rather than a linear one (i.e., draft a strategy, implement the strategy and then sustain its positional or resource advantage). Innovations are based on assumptions, as an entrepreneur knows very little about how events will unfold. These assumptions are tested through the implementation process. In this regard, adherence to a linear view can result in a commitment to a doomed course of action, as newly emerging evidence may reveal flaws in assumptions. Therefore, shifts in organisational competencies, strategies, architectures, operations and teams may be required, which in turn may give rise to a need to manage internal change even at the early stages of start-up development (Tushman and Anderson, 2004; Ries, 2011). Moreover, if a new product or service is perceived in the market as more useful than existing alternatives, users might change their buying and consumption behaviours (Frederiksen and Knudsen, 2017). As such, innovations cannot only entail changes in practices external to the organisation, but also cause paradigm changes and industry shifts (Christensen, 2016).

To further build a methodological foundation for this study, it is necessary to understand the stages and characteristics of the innovation process, and to highlight the fields in which entrepreneurial efforts are required to achieve commercialisation.

1.1.6. Innovation management in technology-driven entrepreneurial organisations

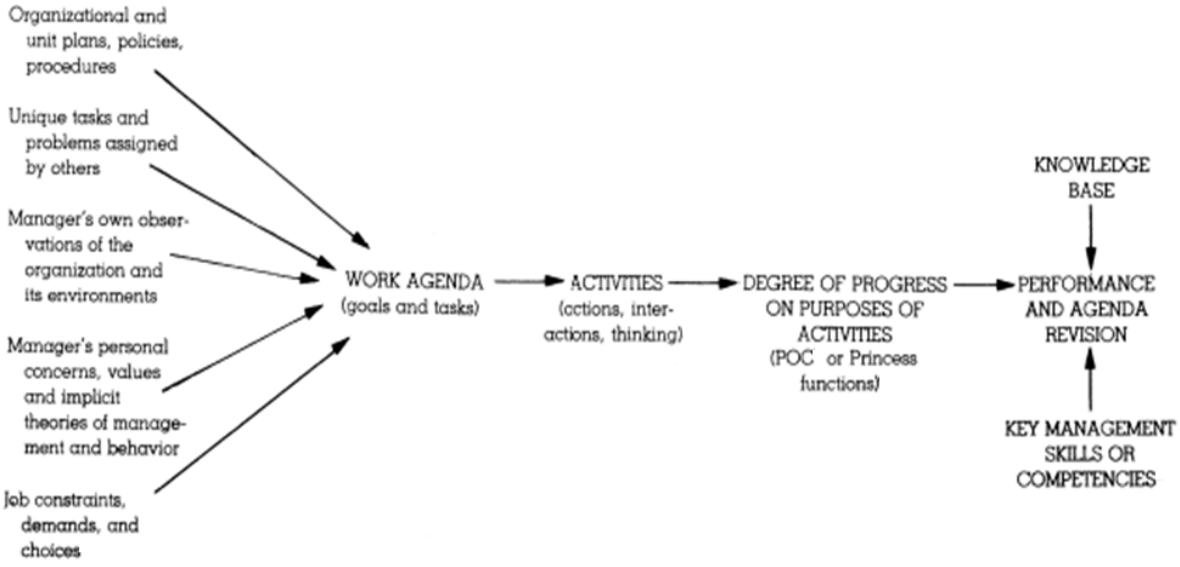
If we accept the idea that innovation is a process that starts with idea generation and continues through to idea commercialisation in the form of a product or service adopted in the market (see Figure 1.1), it seems reasonable to concentrate on innovation implementation in the initial stages of IDEs' development. In this regard, innovation management can be viewed as a distinct managerial dimension mainly associated with R&D management, technology deployment and the successful introduction of the product on the market. Alternatively, if innovation commercialisation outside the organisation is impossible, perhaps one should adopt a broader outlook and consider other managerial dimensions, such as people, organisational processes, systems, culture and leadership.

In the extant literature, the notion of management and the functions that a manager should perform are heavily debated (Mintzberg, 1971; Pavett and Lau, 1983; Carroll and Gillen, 1987; Carroll and Peat, 2010). Mintzberg (1971) suggests that Fayol's classical approach (1916; seen in Mintzberg, 1971), in which a manager's functions are defined as a linear

sequence of planning, organising, coordinating and controlling stages, is outdated. Mintzberg (1971) then describes 10 roles of managers within three areas of responsibility – interpersonal, informational and decisional.

Carroll and Gillen (1987) challenge the usefulness of Mintzberg's (1971) views, which they suggest do not help managers understand how they can ensure that the desired results are achieved. According to Caroll and Gillen (1987), management's ultimate goal is to ensure progress towards an activity's purpose. In their study, they adopt the process view on management. Their "PRINCESS" model (Caroll and Gillen, 1987) encompasses a set of eight basic managerial functions, such as planning, representing, investigating, negotiating, coordinating, evaluating, supervising and staffing. These functions are built into the system of manager's work (see Figure 1.9), and determine the meaning of his or her activities. Performance is assessed based on the predetermined targets, which result from the tasks assigned to managers by others.

Figure 1.9. A model of the manager at work



Source: Caroll and Gillen, 1987, p. 47

In this respect, the classical approach to management, especially as regards to innovation management, is not applicable in the context of the knowledge economy and the digital era. As discussed in Section 1.1.1, the intrinsic uncertainties of innovation eliminate any predictability and challenge the setting of clear targets that are intended to be linked to forecasts. These uncertainties even challenge the applicability of such fundamental managerial functions as planning, which aim to determine the course of action. Ries (2011, p. 9) declares that "planning and forecasting are only accurate when based on a long, stable operating history and a relatively static environment", which cannot be found in innovation. Therefore, a new approach to the management of innovations should be

developed in which strategy is built not on planning but rather on learning through experimentation with consequent adjustments of actions. This leads to a fundamental re-conceptualisation of managerial functions, which must now focus on managing iterative loops rather than a sequential series of activities (Galavan et al., 2008, p. 164).

According to Dodgson et al. (2014), innovation management should extend beyond the activation of underlying mechanisms – such as invention, creativity, and the imaginative recombination of existing ideas and technologies – or the stimulation of the processes that encourage its implementation, such as change management. Innovation management also involves organisational activities that ensure an effective recombination and reconstitution of resources (both physical and intellectual) to commercialise ideas and create something new, as discussed above. The implementation of innovation involves learning, and is associated with re-skilling and "pivoting" (Ries, 2011), which serve to transition entrepreneurial teams and institutions away from pre-determined, well-charted paths. As discussed in the literature (e.g., Dodgson et al., 2014), change management as a distinctive managerial function is less of an issue for innovative organisations, as they continually adjust and renew their capabilities as a matter of course. As such, change becomes an accompanying rather than a driving element of innovative enterprise management.

Several researchers demonstrate that different types of innovation give rise to different managerial practices (Dodgson et al., 2014; Holahan et al., 2014). As the level of innovativeness increases, so do the number of controls imposed, which not only leads to less flexibility in the development process, but also gives rise to a need for more professional, full-time project leadership; centralised executive oversight for new products; and formal financial assessments of expected performance (Holahan et al., 2014). In contrast, less innovative projects are typically more informal, experiment-driven ventures. At first glance, the fact that radical innovation implies a higher level of creativity might be seen as contradiction, as creativity cannot flourish within the rigid framework of control. On the other hand, this should be considered in the context of institutional and industry settings. As discussed above, radical innovations are rare, and they often emerge from intrapreneurship endeavours aimed at commercialising scientific discoveries within a parent-organisation setting. That setting is typically characterised by a higher level of bureaucracy and a reliance on formalised procedures aimed at arriving at an outcome in a planned way. Radical innovations (as measured by the number of patents) are more likely to occur in science-intensive industries (e.g., chemical, bioscience, information science) and in production-intensive industries (e.g., scale-intensive industries, such as gas, power,

material processing and handling, metal working, engines and parts, optics, transportation and motors; and specialised supply industries, including surgery and medical instruments, measurement and testing) (Park et al., 2005). Radical innovations are rarely found in supplier-dominated industries (e.g., agriculture, food, textiles, apparel, furniture, house fixtures) or in service industries (Park et al., 2005). Thus, the more formalised project-management approaches observed by researchers can also be attributed to the domination of the engineering mind-set in science- and production-intensive industries (e.g., Holahan et al., 2014, studied the aerospace and manufacturing industries).

Incremental innovations involving the renovation of existing products and processes are the most common form of innovation and are found in all industries (Dodgson et al., 2014). These innovations require fewer resources and financial investments. Moreover, they have a smaller scope and can be commercialised within a shorter period of time. They are often implemented by independent entrepreneurs, who tend to be more flexible. Incremental innovations lay the groundwork for the continuous improvement of a company's processes, products, position or business model, and are often driven by "lean" thinking (Tidd et al., 2005; Womack and Jones, 2006).

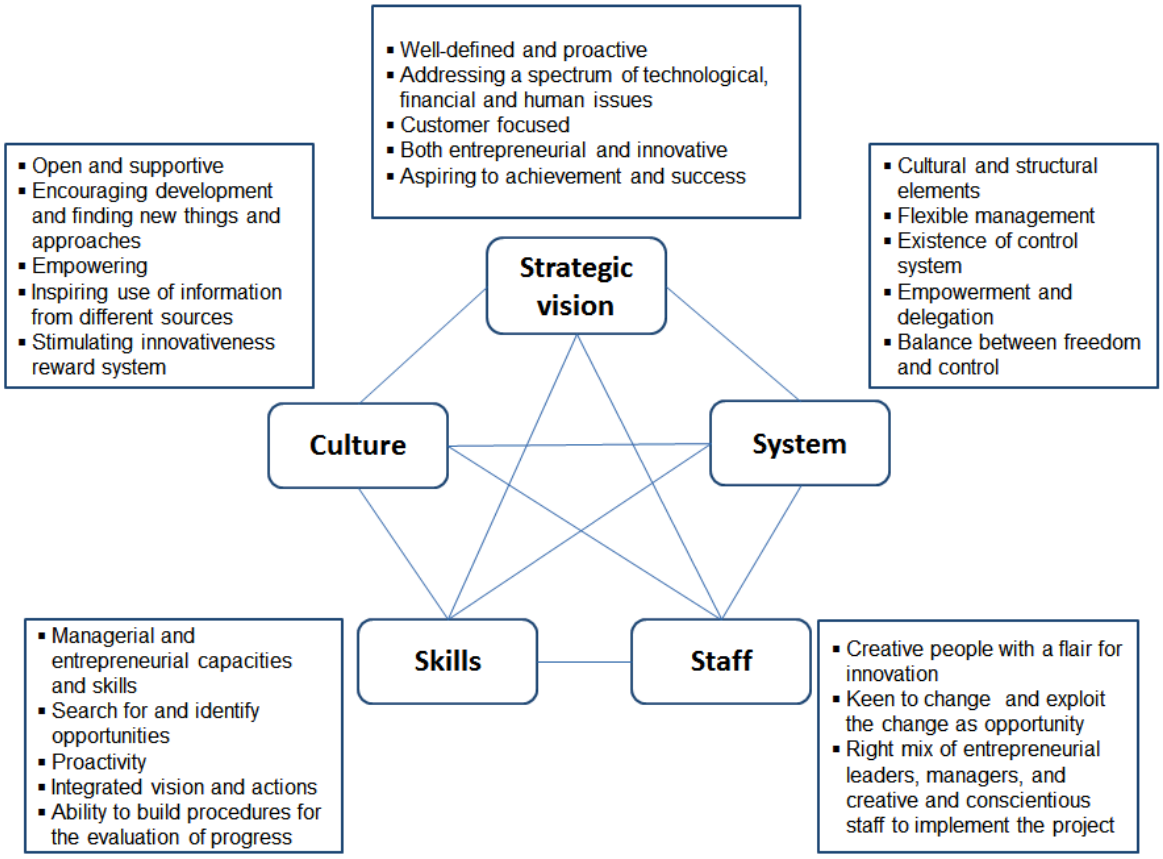
These observations imply that there is no universal model of innovation management applicable to all organisations. Nevertheless, it can be useful to identify the key principles of the management of innovative organisations. The implementation of these principles in practice might depend on the type of innovation, a particular actor (i.e., entrepreneur or intrapreneur) or broader contextual factors that that affect innovation, such as industry-specific characteristics or innovation ecosystems (Dodgson et al., 2014).

Given that innovation management will be analysed in the current study on the level of an innovative enterprise aiming to develop ideas into commercialised products or services, it is necessary to determine which managerial activities, functions and tasks entrepreneurs must handle in order to be successful. It is also necessary to define "success" in this case.

A start-up is "a human institution designed to create a new product or service under conditions of extreme uncertainty" (Ries, 2011, p. 27). The building of a human enterprise includes hiring creative employees, coordinating their activities and creating a company culture that delivers results. Such organisations also include the systems and processes needed to create and realise a business opportunity, all of which encompass a combination of tangible (e.g., available resources) and intangible (e.g., industry and market knowledge) element.

Zhao (2005) declares that innovative entrepreneurship requires efforts in five dimensions: strategic vision, system, staff, skills, and culture (see Figure 1.10).

Figure 1.10. Dimensions of innovation management in a new venture



Source: adapted from Zhao, 2005

According to Tidd et al. (2005), innovation management includes the integration of technological, market and organisational developments, which is a knowledge-based process. Maurya (2012) proposes that in order to meet the requirements of today's economy, the key principle in innovation management should be to optimise organisation efforts to *achieve speed, learning and a focus on customer needs*, which can be recapitulated as "the right offering at the right time". An emphasis on understanding clients and on the development of new markets should be at the core of any entrepreneurial strategy (Zhao, 2005) aimed at commercialising an idea and gaining a competitive advantage through innovation.

According to Ries (2011), the functions of an early-stage venture are vision and concept (business model) formulation, product development, marketing and sales, the scaling up of operations, partnership establishment, distribution, and structural and organisational design. The fundamental activities of an entrepreneurial venture are turning ideas into products, measuring customer responses, and learning whether to then pivot or persevere.

Ries (2011) points out that all successful entrepreneurial venture processes should be geared toward accelerating this feedback loop.

The distinctiveness of Ries's (2011) approach, which is proposed in his book *The Lean Start-up*, is the suggestion that organisations reconceptualise their value-creating activities by building quality into products from in "inside out", thereby eliminating waste. Given that customer focus and speed are key for achieving success, he suggests shortening the period of research and development as much as possible, and giving customers a minimum viable product (MVP) to begin using. He argues that an entrepreneur should not fear the consequences of shipping a bad product, as this fear results in postponements of launches, and leads to time and resources being wasted on polishing an offer so that it is perfect from an engineer's (rather than a customer's) perspective. When an MVP is offered to users, their feedback will highlight needs for improvement or, in extreme cases, for a complete re-building of the product to meet customers' expectations. Ries calls this approach "validated learning" and argues that it provides

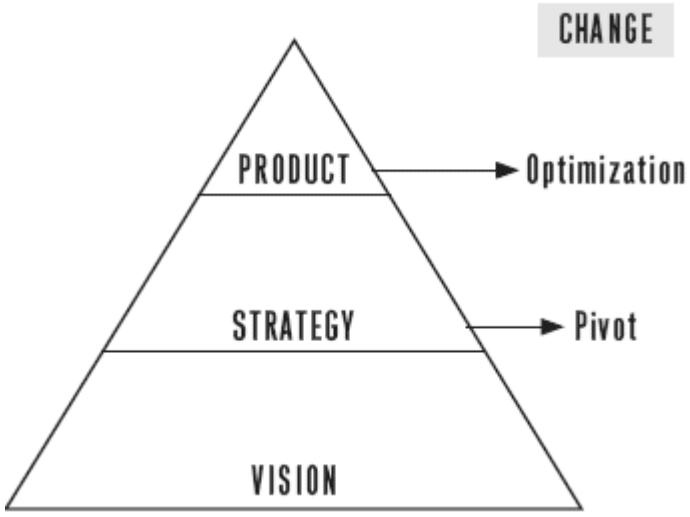
> "a method for measuring progress in the context of extreme uncertainty. It can give entrepreneurs clear guidance on how to make the many trade-off decisions they face: whether and when to invest in process; formulating, planning, and creating infrastructure; when to go it alone and when to partner; when to respond to feedback and when to stick with vision; and how and when to invest in scaling the business" (Ries, 2011, p. 19).

Notably, Ries (2011) developed his approach while considering the business practices of service companies. As most of those companies were Internet based, the consumption of a company's unfinished offering (MVP) was unlikely to seriously harm a client. In contrast, offering a customer access to an unverified drug or untested machinery is likely to have a negative outcome, so this approach cannot be used universally. However, it has some useful implications that can be considered by any new venture wishing to achieve success in the fast-developing knowledge economy.

Ries (2011) points to what he views as a paradigm shift in the development of entrepreneurial strategy, the starting point of which is not a technological idea converted into product, but a strategic vision of creating "a thriving and world-changing business". According to Ries, "to achieve that vision, start-ups employ a strategy, which includes a business model, a product road map (rather than predetermined plan), a point of view about partners and competitors, and ideas about who the customer will be. The product is the end result of this strategy" (Ries, 2011, p. 22) (see Figure 1.11). He suggests a need to start thinking about an engine for acquiring new customers and ways of developing a customer base from the very beginning of an entrepreneurial venture, as sales will ultimately allow a

business to succeed. In the very early stages, entrepreneurs must understand and build a customer archetype (Aulet, 2013) that is initially more of a hypothesis than a fact. Via validated learning, a company will be able to understand whether it can serve this type of customer in a sustainable way. A product will change constantly as a result of incorporating improvements in response to customer feedback (Ries, 2011). Ries (2011) calls this a "product optimisation process". Less frequently, experimenting and measuring customer feedback may reveal a need for significant changes in strategy (a "pivot"). However, in Ries's (2011) opinion, the overall vision rarely changes.

Figure 1.11. Strategic pyramid



Source: Ries, 2011, p. 22

In this respect, the development of an innovative company happens in fits and starts. Much of a start-up team's time is spent on improving products, marketing or operations (Ries, 2011). Instead of developing complex plans based on various assumptions, innovative entrepreneurs make constant adjustments using a "steering wheel" called the build-measure-learn feedback loop. Through this process, they can learn when and whether it is necessary to make a sharp turn (pivot) (Ries, 2011).

Ries (2011) distinguishes pivots from changes. In his opinion, a pivot is a special kind of change designed to test a new fundamental hypothesis about the product, business model or growth engine. He identifies several types of pivots that an innovative start-up may envisage (see 0).

Table 1.4. Types of strategic pivots

Type	Description
Zoom-in pivot	In this case, a single feature in a product becomes the whole product.
Zoom-out pivot	In this type of pivot, a whole product becomes a single feature of a much larger product.
Customer-segment pivot	In this pivot, the company realizes that a product it is building solves a real problem for real customers. However, these customers are not the group it originally planned to serve. In other words, the product hypothesis is partially confirmed – the company is solving the right problem – but for a different customer group than originally anticipated.
Customer-need pivot	As a result of getting to know customers extremely well, it sometimes becomes clear that a problem a company is trying to solve is not very important for those customers. However, owing to this customer intimacy, other related and more important problems are often discovered, and they can be solved by the company. In many cases, these related problems may require little more than a repositioning of the existing product. In other cases, they may require a completely new product.
Platform pivot	A platform pivot entails a change from an application to a new IT platform or vice versa. Often, start-ups that aspire to create a new platform begin by selling a single application.
Business architecture pivot	Companies generally adopt one of two major business architectures: high margin, low volume (complex systems model) or low margin, high volume (volume operations model). The former is associated with business to business (B2B) or enterprise sales cycles, while the latter is associated with consumer products (with notable exceptions). In a business-architecture pivot, a start-up switches architectures. Some companies change from the complex systems model by going mass market (e.g., Google's search "appliance"). Others originally designed for the mass market are found to require long and expensive sales cycles.
Value-capture pivot (monetization Pivot)	The value that a company creates for a customer should result in revenue for that company. Methods of capturing that value are referred to as monetization or revenue models. How value is captured is an intrinsic part of the product hypothesis. Often, changes in the way a company captures value can have far-reaching consequences for the rest of the business, and for product and marketing strategies.
Growth-engine pivot	Three primary growth engines power start-ups, especially Internet-based start-ups: viral models, sticky models and paid-growth models. In this type of pivot, a company changes its growth strategy in order to seek faster or more profitable growth. Often, a growth-engine pivot also requires a change in the way value is captured.
Channel pivot	In traditional sales terminology, the mechanism by which a company delivers its product to customers is called the sales channel or the distribution channel. Often, the requirements of the channel determine the price, features and competitive landscape of a product. A channel pivot is a recognition that the same basic solution can be delivered through a different channel with greater effectiveness.
Technology pivot	Occasionally, a company discovers a way to reach the same solution by using a completely different technology. Technology pivots are more common in established businesses. However, a start-up can sometimes find a new technology that offers superior pricing power and/or performance relative to the existing technology.

Source: Ries, 2011, p. 173

According to Ries (2011), pivots are a necessity for any growing start-up wishing to achieve better results. The typology proposed by Ries (2011) appears to be very useful in the context of the current study. Pivots start with collecting feedback and measuring product performance. They also include a learning stage in which the start-up works to understand the causes and find solutions. Learning is not easy for several reasons. First,

people tend to stick to their existing mental models – spotting new patterns requires managers to revise or even abandon their established course of action (Galavan et al., 2008). Second, changing a strategy during the learning process requires quick reconfiguration of the company's operations. Therefore, pivoting may force a company to actively seek networks that can provide moral support as well as access to additional (physical and intellectual) resources. In that respect, start-ups that pivot are likely to be more actively involved in networking.

As Galavan et al. (2008) suggest, for managers wishing to develop an innovative organisation, letting go of the old is as important as spotting the new:

> Managers must keep their mental models fluid and modify them in light of changes in the broader context, as a first step to adapting their organisations to these changes. Indeed, managers must remain open to the possibility of abandoning their established models altogether (Galavan et al., 2008, p. 178).

If this is indeed the case, then traditional approaches of measuring project performance against predetermined targets (e.g., profits, costs and timeliness) are inapplicable. However, to ensure control, the success of an innovative enterprise should at least be measured in terms of whether significant milestones are achieved. Thus, appropriate measures of an innovative start-up's progress should be developed. Although innovations are built around learning, learning as an outcome (e.g., in terms of inventions, patents, media coverage or number of publications; Cordero, 1990; Johannessen et al., 2001; Adams et al., 2006) is unlikely be a satisfactory indicator of success for entrepreneurs and venture capitalists. Traditional performance measures related to financial results arising from innovations, such as sales or returns on investments (Gemunden et al., 1996; Wang and Kafouros, 2009; Zeng et al., 2010), may also be inapplicable if sales are absent. It is also very difficult to measure market success relative to competitors (Johannessen et al., 2001; Palmberg, 2006) in the early stages of start-up development.

To build a substitute measure relevant in the context of this study, one can adopt the ideas of the "value hypothesis" and "growth hypothesis" introduced by Ries (2011). He defines the value hypothesis as an instrument for testing whether a product or service delivers value to customers using it. For the growth hypothesis, he proposes testing how new customers will discover a product or service. This will at least allow for estimation of the likelihood of future sales, even when sales are currently absent. Two other measures can be taken from the project approach. The first, which relates to the cost side of the project, measures the extent to which costs incurred correspond to the cost targets set in the business plan. The other, which relates to the project's timeline, measures the extent to

which actual performance matches the schedule in the business plan. Although the latter two measures might not be related to the final success of the project for the reasons explained above, they at least show whether an innovative organisation is working hard, operating efficiently and respecting its obligations to investors.

1.1.7. Conclusions

The essential aims of this section in the context of the current study were to build an understanding of innovation and its types, to investigate the key areas that should be managed in the course of the innovation process and the activities that managers need to undertake to accompany its development, and to identify specific features of innovation implementation that may require different networking behaviours. Other aims were to provide a conceptual background for the terminology used in this study for analysing the types and level of SMEs' innovativeness, and to uncover the dimensions (control variables) that are important for evaluating the effects of networking on innovation and should be discussed with participants in this study (i.e., in the course of interviews with entrepreneurs). The results of this literature review make it possible to determine the scope and general framework for this study.

The scholarly views considered in this section allow for the formulation of the following definition of innovation for the purposes of this study: *firm innovation is the successful exploitation of ideas for the creation and introduction of a completely new or significantly improved offering or customer experience*. In the context of this definition, "success" is understood as a match between the results of innovative activity and the firm's expectations in terms of the value it creates for customers (value proposition), the suitability of the initial business model (business-model proposition), sustained growth in terms of meeting expectations for initial customers and compliance with sales plans, budgets and timeframes (growth proposition).

The extant literature stresses the need to distinguish between more innovative (innovation-driven) and less innovative (conventional) small and medium enterprises. The former are perceived as heavily involved in the invention stage and they see their business aim as implementing the technology in the market. The latter are viewed as less concerned with novelty and more concentrated on the exploitation stage, and they aim to serve a particular client segment. The literature indicates that entrepreneurial organisations committed to implementing innovation should be managed differently than low-innovative enterprises. This is primarily due to the necessity of managing risks when entering new and uncertain

areas, and the differences in the business-development trajectories resulting from the fact that conventional SMEs do not need to go through the stages associated with R&D. Therefore, as companies with various degrees of innovativeness differ in terms of development stages, they require different forms of external assistance and, consequently, they can establish network relationships in different ways. Therefore, in order to determine the role of networking in innovation, it is important to be able to distinguish companies based on their degree of innovativeness. Thus, the degree of innovativeness is an important control variable in this study.

The extant literature proposes that companies may simultaneously innovate in different directions in an attempt to produce an offering that will be viable in the market. In terms of this study's *research scope*, innovation is viewed as a process that results in the launch of a concrete offering in the market. Based on this approach, the study aims to offer a comparative analysis of entrepreneurs' and intrapreneurs' networking behaviours in innovative projects that differ in terms of their innovativeness. Moreover, to uncover differences in networking behaviour evident in more innovative (innovation-driven) and less innovative (conventional) SMEs, this study relies on case studies of *innovative projects* that result in the commercialisation of ideas as distinct products or services, rather than studies of *companies* that manage portfolios of innovative ventures or companies that view innovation management as a driver of productivity or efficiency of activities associated with already existing offerings.

If different types of innovation and the associated features of their implementation may require different networking behaviours, then it is necessary to be able to identify the degree of novelty in the business venture ("how new") and the novelty of the entrepreneurial project ("what is new"). The typologies of innovation serve as the foundation for identifying the relevant characteristics that can be used as prompts for discussing SME innovativeness with entrepreneurs.

The stepwise model of innovative entrepreneurial organisation development developed in this section as result of the literature analysis (see Figure 1.5) provides a framework for understanding the stages that entrepreneurial organisations can go through and the associated tasks they should perform to develop and launch their offerings in the market. The stage of innovation development in which an SME finds itself can determine the content and structure of that SME's business network. Therefore, it seems reasonable to introduce a control variable that describes the phase of innovative project development. In this study, the stages identified in this section were used as prompts in interviews with

entrepreneurs in order to obtain a comparable understanding of their business projects' development.

The literature analysis indicates that different types of entrepreneurs (i.e., novices, serial entrepreneurs and intrapreneurs) differ in terms of their mindsets, behaviours and strategies, especially when a new venture is in the "valley of death". Previously acquired experience changes an entrepreneur's networking behaviour, which is needed in this stage to access necessary resources and knowledge. In addition, such experience provides self-confidence in decision making, which in turn becomes less limited by the fear of losing control or forfeiting technological know-how. The literature also suggests that an intrapreneur's location in a corporate context provides more access to support, resources and skills. At the same time, it restricts the intrapreneur's autonomy in decision making and limits opportunities to establish the necessary relations. These considerations led to the need to include questions covering the entrepreneurs' background and the degree of independence of the focal entrepreneurial projects in the interviews.

The analysis of scholarly literature on innovation management leads to the conclusion that classical managerial approaches are unlikely to be able to embrace the specifics of the innovation process, which is ultimately non-linear and unpredictable. In start-ups, innovation-management strategy is viewed as part of an ongoing process of trying new things, learning from mistakes and making mid-course corrections ("pivots", Ries, 2011). Moreover, managerial activities should be perceived as a looped set of actions focused on recognising emerging patterns in order to anticipate new opportunities and threats. In managing innovations, entrepreneurs should be prepared to revise assumptions, priorities and promises; to reconfigure strategies to ensure vision realisation; and to abandon their established action models even if resources have already been spent and the organisation has come a considerable way in the model. This concept of innovation management implies that entrepreneurs need to constantly exchange knowledge and information with diverse circles of people and organisations (i.e., through networking), test their understanding of the next step, and search for necessary information and resources. Thus, in the interviews, it seemed productive to discuss innovation-management strategies and project-development trajectories from the point of view of the pivots that had taken place, as this provided a context for understanding the contacts that entrepreneurs needed and for what purposes.

Finally, this section considers the evolutionary nature of innovation. Different innovation models have emerged at different points in time in response to contemporary challenges of

economic development. The literature suggests that although a newly developed innovative model constitutes a best practice at each stage, all models exist simultaneously in various forms. This may be explained by the specific features of different industries and their competitive landscapes. For example, among companies in traditional (not knowledge economy), technology-intensive industries (e.g., mining and processing), the first-generation "technology-push" model, which aims to intensify resource usage, can still exist. In the IT industry, which is a knowledge-economy industry, a sixth-generation model that relies heavily on networking is more likely to drive innovation. Thus, an entrepreneurial venture's presence in a particular industry can, to some extent, determine its innovation behaviour, its need to build relationships to attract necessary resources, and its need to integrate partners' activities on the strategic and operational levels in order to achieve better market fit. Therefore, control variables that identify the industry in which a company operates should be specified.

To summarise, Section 1.1 has built an understanding of innovation and innovation management in a start-up, and identified the key managerial activities, functions and tasks that entrepreneurs must handle in order to achieve commercialisation. In order to understand the role of networking in innovation in entrepreneurial organisations, it is necessary to build a conceptual understanding of networking and consider the views of scholarly research on key questions in this knowledge domain.

1.2. Networking

This section presents a review of scholarly research on networking with a particular focus on entrepreneurial firms' networking behaviours. It begins with a definition of the concept of networking, and a discussion of the role of social capital as well as approaches to network coordination and governance. Then it identifies the benefits, opportunities, costs and risks of innovation networks described in the extant literature. Thereafter, the typologies of networks used by different researchers are summarised with an emphasis on networks established by entrepreneurs. This is followed by a discussion of the characteristics of those networks and an investigation of whether the evidence indicates that some network types are particularly conducive for innovation. The section summarises the findings from several systematic literature reviews with the aim of uncovering gaps in the nascent theory of the entrepreneurial firm's network development. At the end of the section, the role of the country context in networking is investigated, and the Russian example is studied with the goal of understanding the legacy of network establishment in Russia.

1.2.1. Theoretical underpinnings of networking

Despite extensive use of the term, there is no commonly agreed definition of a "network" (Hämäläinen and Schienstock, 2001). Broadly speaking, a "network" is a set of interconnected nodes (Castells, 2000). However, the meaning of "node" depends on the type of network. A node can refer to individuals within an organisation, firms contributing to a joint project or a group of actors that have pooled their resources with the explicit intention of accomplishing specific goals. Network boundaries are defined by the interactions among the elements within the network, the intensity of which is significantly higher than the intensity of contacts between those elements and elements outside the network (Ard-Pieter de Man, 2004).

In the spheres of business and management, a network is as a free association of people or firms capable of creating structures and processes, implementing joint decision making, and integrating efforts in order to achieve a goal that typically has economic significance for the network's members (Turyakira and Mbidde, 2015). Networks are often understood as "loose couplings" (Hämäläinen and Schienstock, 2001), which distinguishes them from relationships that are more structured and formalised (e.g., by means of a contract in the case of market relations or regulation in the case of hierarchical structures). Network relationships require a certain period of time and effort to develop (Hämäläinen and

Schienstock, 2001). Once established, cooperative networks are characterised by interdependence, continuing communications, reciprocity and a high level of trust (Hämäläinen, 1993; Nahapiet and Ghoshal, 1998). The heart of networking lies in a "relational contract" (Nassimbeni, 1998), which is an implicit agreement regarding the mutual respect of interacting parties' interests, and the fair contribution of the effort and resources needed to achieve a goal. The more innovative the aim of a cooperative network, the more creative and continuously adaptive its approach must be and, consequently, the higher the complexity of the relations within the network (Ard-Pieter de Man, 2004). In other words, if the vision of the outcome and the distribution of the parties' responsibilities is unclear, it becomes difficult to envisage all aspects of established relationships and to formalise them in a contract – a tangible, signed document with legal consequences for non-compliance.

Networking emerged as a separate research subject in the early 1990s. It was believed to be a driving mechanism of development in the new knowledge economy and the digital and information era (Castells, 2000; Powell and Snellman, 2004). Networking is viewed as a distinct form of activity coordination that exists as a fractal at the levels of individuals, organisations, countries and the global economy (Powell, 1990; Castells, 2000; Ard-Pieter de Man, 2004). The main factors that gave rise to the knowledge economy were the rapid development of information technologies, economic globalisation, internationalisation of production, financial deregulation, liberalisation and changing demand patterns (Heiskala and Hämäläinen, 2001). The systemic transformation has created opportunities for innovation at different levels as well as an imperative to participate in such innovation. Broadening and accelerating information flows, the dynamic development of scientific and technological knowledge (Schienstock and Hämäläinen, 2001), and the globalisation of markets put pressure on companies, regions and nations to innovate more rapidly and intensively (Schienstock and Hämäläinen, 2001; Chesbrough, 2006; Edmondson, 2012). The complexity of doing business in the knowledge-economy era has grown significantly when compared to previous periods due to the expanded amount of information, the increase in transparency and the growth in the number of interacting agents involved in collective learning and knowledge transformation. It has also created a need for cooperative efforts to implement innovations (Fernie et al., 2003; Muller and Zenker, 2001). Given the high complexity of the new economy, networking appears to be gradually becoming a dominant function and an efficient way of organising economic activities that are based on knowledge sharing and collaboration. These developments have led to the emergence of such phenomena as the network society (Castells, 2000; Hinssen, 2015). In

the new economy, interorganisational networks are increasingly becoming an instrument through which organisations can bring resources together and widely distribute knowledge in order to jointly develop innovations (Powell and Grodal, 2006).

In this regard, a key question arises: Are all companies that exist in the new-economy era equally dependent on networking? Contemporary literature widely recognises that the knowledge economy that emerged in the early 21st century (Preston and Cawley, 2004), not only gave rise to new approaches to doing business but also resulted in the emergence of new industries that did not exist in the 20th century (Teece, 1998; Christensen, 2013). The distinctive features of businesses in the new knowledge economy include their high innovativeness, their reliance on high-tech knowledge-intensive solutions, and their intention to operate in global markets. The conceptualisation of newly emerged types of organisations has provided new perspectives on the theory of the firm, which suggest that in the new economy a firm can “be understood as a social community specialising in speed and efficiency in the creation and transfer of knowledge" (Kogut and Zander, 1996, p. 503). However, the reality is more multifaceted. Even in the era of the knowledge economy, more conventional businesses active in more mature industries continue to exist. These businesses are usually based on the extraction and processing of resources, or on serving a particular client segment rather than a global market. As such, for conventional businesses, resource and cost considerations might still attract more attention than innovation as a source of competitive advantage (Hämäläinen and Schienstock, 2001).

Compared to innovative businesses, conventional ones operate in less uncertain and dynamic environments that are characterised by less innovation richness (Daft and Lengel, 1986). Due to the maturity of these industries, it can be assumed that a significant amount of relevant information has already been codified, making business-related knowledge more explicit, and allowing for more structured and formalised communications and relations. As such, conventional businesses might require organisational arrangements that rely on market relations focused on cost-benefit optimisation or on hierarchies (Aulet, 2013) to maintain predictability, structure operations and secure resources while optimising costs.

On the other hand, knowledge-based firms operate in a rapidly changing environment that is characterised by diversity of information, much of which is tacit, specialised and embedded in various knowledge holders (Bierly and Hämäläinen, 1995). These firms need to focus on intensive communications, which often take the form of face-to-face interactions with different individuals to reduce equivocality, increase social capital (Daft

and Lengel, 1986) and gain access to the complementary knowledge needed for new insights (Schienstock and Hämäläinen, 2001). Therefore, networking should be more common among those organisations with businesses spanning more innovative areas. Studies published by several authors (e.g., Mole et al., 2016) support this assumption by revealing that not all SMEs are willing to network and make use of external sources of support even when they are available in their business environment.

In terms of the role of networking, Hämäläinen (2001) suggests that even within a single organisation, networking, which is efficient for tackling high uncertainty and complicated tasks (e.g., joint R&D and the production of innovative products or services), co-exists with the market- and hierarchy-focused organisational approaches used for solving less complicated, more traditional tasks (e.g., coordinating prices, pooling financial resources, and co-marketing). In relation to managing cooperation, Nassimbeni (1998) proposes that networking represents an intermediary approach between short-term occasional market mechanisms and long-term, well-structured hierarchical relations. Hämäläinen (2001) states that the comparative advantages of markets, hierarchies and networks depend on the specificity and uniqueness of the assets and knowledge required for interdependent activities; the costs associated with those activities; the extent of interdependency and needs related to activity coordination; and the level of innovativeness of the focal process. Thus, market relations are efficient for managing economic activities in which asset specificity, transaction costs and coordination needs are low. Hierarchies are superior for activities involving high asset specificity, high associated transaction costs, and high interdependency and coordination needs (Hämäläinen and Schienstock, 2001). However, in both cases, the expected outcome is relatively predictable, standardised or, at least, amenable to planning. Networking is viewed as the most efficient arrangement for managing activities in uncertain environments as well as activities leading to innovative outcomes. At the same time, Schienstock and Hämäläinen (2001) propose that networks offer a comparative advantage in activities characterised by intermediate levels of asset specificity and transaction costs. In networking, the need for coordination can be high due to the diversity of knowledge and resources being pooled together and the high degree of interdependence among network participants committed to solving innovation challenges through joint efforts (Schienstock and Hämäläinen, 2001).

If we assume that when a company is involved in highly complex and innovative business areas or problems, it must establish complex relationships, then the opposite can also be true. The principle of rational minimisation of efforts and costs (Simon, 1991) implies that

the more conventional the business or task addressed by a company, the simpler are the relationships required for its management. Hämäläinen (2001) provides a useful typology that explains the nature of interdependence in different types of co-operative relationships established by firms depending on the level of innovativeness (see Table 1.5).

Table 1.5. Types of co-operation interdependencies

	Interdependence	Definition
Less innovative ↑	**Pooled**	A relationship is established with a partner if its activities contribute to the firm's overall goal.
	Sequential	A relationship is established with a partner if the partner's value-adding activities must be performed before the focal firm performs its value-adding activities.
More innovative ↓	**Reciprocal**	A relationship with a partner is based on value-adding activities that relate to each other as both inputs and outputs through feedback loops.
	Team	Multifaceted systemic interdependence involves several reciprocal links with few economic agents.

Source: Adapted from Hämäläinen and Schienstock, 2001

In light of the above-mentioned characteristics of networking, reciprocal and team interdependencies can essentially be referred to as network relations, while pooled and sequential interdependence refer to market and hierarchical relations. Consequently, it is accurate to refer to modern networks as "innovation networks", thereby highlighting the main purpose of networking in the knowledge-economy era.

1.2.2. The role of social capital

As discussed in the previous section, networking relies heavily on informal and voluntarily assumed "relational contracts". Related commitments and mutual obligations arising from relational contracts generate "social capital" (Walker et al., 1997). The term "social capital" emerged in sociological studies of interpersonal relationships (Tsai and Ghoshal, 1998). Granovetter (1973) showed that a wide sphere of social ties is an asset that gives an individual an advantage when searching for professional employment. This notion was later extended to a larger group of interacting actors. According to Coleman (1988), social capital works like any other asset, such as physical or human capital. It allows for the achievement of certain outcomes that would otherwise not be possible to achieve. This is the result of the win-win collaboration and the synergetic effect of pooling the efforts of network members (Trott, 2008).

Collier (2002) considers social capital as "social" because it generates externalities through social human interaction. It is "capital" only if it has value. In other words, it must offer access to necessary information or resources, or be able to influence the decision-making

process (Batjargal, 2003). As such, social capital is a means of enlarging the accessible resource base and enabling business transactions that would otherwise be costly, risky or difficult to conduct (Butler and Purchase, 2008). Social capital is embedded in networks of mutual acquaintance and recognition (Nahapiet and Ghoshal, 1998) through which people are willing to exchange favours or share resources (Nguyen and Cragg, 2012).

When referring to Granovetter's (1992) discussion of structural and relational embeddedness, Nahapiet and Ghoshal (1998) identify two main aspects of social capital – structural and relational. The structural aspect refers to the concepts of "centrality" and "betweenness", and indicates that an actor's position and embeddedness in a certain structure, organisation or network can provide access to resources, information, power or other intangible advantages. Butler and Purchase (2008, p. 533) suggest that the amount of structural social capital depends on "the number of connections, the proximity of connections with powerful players, the diversity of the connections and the network position of the actor, relative to other network players". The relational aspect of social capital refers to the access to assets and resources made possible through relationships (Nahapiet and Ghoshal, 1998). Butler and Purchase (2008) propose that the relational aspect should supplement the structural one, reasoning that the existence of structural embeddedness does not necessarily mean that social capital will be forthcoming. Without well-established relations based on trust, commitment, understanding and honesty (Naudè and Buttle, 2000), or resulting from perceived obligations to provide favours because of pre-existing close connections, actors may be unwilling to give other actors access to valuable resources. In fact, they might perceive doing so as irrational or risky due to the possibility of opportunism (Butler and Purchase, 2008). Granovetter (1992) proposes that when established ties become socially embedded personal relationships, the exchange of resources within the network is likely to depart from pure economic and rational motives, and to be determined by social dynamics. Therefore, to enhance the effectiveness of social capital and reduce its costs, the quality of relations should be continually enhanced and converted into long-term, trust-based relationships (Naudè and Buttle, 2000).

Chenhall et al. (2011) define social networking as a way in which inter-organisational exchanges can be managed with an emphasis on informal personal contacts and social connections. They state that this approach can be employed as a means for developing preferential business connections in response to competitive pressures, and that it can help achieve desired outcomes faster and cheaper. These authors also suggest that social networking is usually a part of the management system employed by modern organisations

to conduct inter-organisational exchanges along with the formal planning and control measures that exist in the frame of institutionalised and structured relations. They also indicate that, in some organisations, social networking becomes the usual or even the only way of engaging in inter-organisational exchanges. As such, in extreme cases, this approach to doing business can transform into favouritism and corruption, which are not only unethical but may also negatively affect value creation owing to conflicts between organisational and individual interests in one or both participating organisations (Nguyen and Cragg, 2012).

The literature provides a range of evidence that weak ties and social networking are able to enhance innovation, as they help to efficiently attract complementary competences and resources through more personal and trusting connections that are less bureaucratic (Chenhall et al., 2011). Social networking is particularly useful for entrepreneurs, as they often lack the resources and knowledge they need (see section 1.1). However, as Davidsson and Honig show (2003), social networking, which is effective in the nascent stages of an entrepreneurial project, becomes less important in the late stages of a business's development.

1.2.3. Network coordination and governance

The different types of interdependencies that arise in cooperative relations are subject to different coordination mechanisms (Hämäläinen and Schienstock, 2001). Thus, the literature suggests that pooled interdependencies are usually coordinated through rules, regulations and standards (Daft and Lengel, 1986; Hämäläinen and Schienstock, 2001). Sequential interdependencies require the incorporation of more pro-active approaches and are coordinated by means of planning, sometimes with the help of information systems. The management of reciprocal interdependences requires mutual adjustments and integration. To a large extent, these interdependencies can still be managed with the help of IT systems, but those systems must be more complex and integrated. Team interdependence is characterised by a large amount of multidimensional explicit and implicit data, the coordination of which requires intense interactions among participants, including face-to-face team meetings, to exchange understandings and build shared values and vision (see Table 1.6).

Table 1.6. Coordination of interdependent activities

Types of interdependencies	Similarity of resources and knowledge	
	LOW	**HIGH**
Pooled	Rules, regulations and market-based contracts in which prices reflect supply and demand quantities	Industry standards, contract mechanisms
Sequential	Planning	Cooperative planning, control over IT systems
Reciprocal	Mutual adjustments, usually through IT systems	Integration of efforts through designated people and their coordination activities
Team	Shared vision and values	Team meetings to share understandings and coordinate efforts

Sources: Daft and Lengel, 1986; Hämäläinen and Schienstock, 2001

When resources and knowledge are dissimilar, the amount and richness of information is extensive (Daft and Lengel, 1986), and the interdependence of network participants is high, the need for qualitative coordination is greater, more complicated managerial mechanisms are necessary, and associated costs increase (Hämäläinen and Schienstock, 2001). Based on the rationality of decision making, Hämäläinen and Schienstock (2001) propose that firms will only use more complicated and resource-intensive forms of coordination, such as cooperative planning, mutual adjustments, group meetings and shared understandings, values and visions, if network participants are highly interdependent. Notably, the level of interdependence rises with increases in the specialisation of knowledge and uncertainty in the environment.

Table 1.2 is useful for understanding the principles behind choosing a mechanism for coordinating collaboration (i.e., the "hardware of collaboration"). The fundamental difference between network relations and market and hierarchical relations is the former's lack of legally binding contracts or regulations that oblige the network members to interact and contribute to the network's development. As mentioned above, network participants interact on the basis of a voluntary relational contract, which often serves as a "software of network collaboration". In order to understand how a network functions, it is necessary to examine the formation and governance of relations between participants. In particular, it is enlightening to investigate the extent to which relationships among participants in the network are determined by the presence of either economic or social interests. In that respect, it also seems interesting to supplement Hämäläinen's typology (see Table 1.6) with the understanding of whether the level and role of personal social embeddedness among network members varies depending on the type of interdependency and the level of innovativeness.

Slotte-Kock and Coviello (2009) propose that both economic and social relationships are embedded and interweaved in networks. Jack et al. (2010) suggest that the development of social ties is important for the operation of a network and that, to a large extent, personal social relations serve as the network governance mechanism. Moreover, social relationships embedded in networks influence economic decisions and actions (Hite, 2010). Jack et al. (2010) note that as networks mature, there is a shift away from purely economic and calculative relationships toward affective personal ties. This might have both positive and negative consequences.

As they interact, network members develop personal relationships and behavioural norms that are characterised by identity, respect, trust and assumed obligations. Those relationships can even evolve into friendships (Hämäläinen and Schienstock, 2001). Network interactions form a common cognitive space that includes understandings, mental frames, language narratives and meanings shared among network members (Hämäläinen and Schienstock, 2001). All of this serves as a unifying social context, and reduces information-processing needs and coordination costs (Nahapiet and Ghoshal, 1998). Shared language and cognitive frames promote the intensive communications required for combining complementary knowledge, thereby increasing innovative capabilities (Hämäläinen and Schienstock, 2001). Shared behavioural norms support the development of trust among network members, as they allow members to anticipate the behaviour of their counterparts. Moreover, they use the same norms as guidance for their own behaviour towards network members (Hämäläinen and Schienstock, 2001). Established personal ties motivate network partners to share private resources, secure their commitment to contributing to the network's development and serve as grounds for social capital development (Uzzi, 1996). Therefore, personal social embeddedness allows for the more effective achievement of networking goals.

On the other hand, strong inter-personal relations can have negative systemic effects, such as behavioural rigidities, conservatism and an unwillingness to act, caused by perceived personal costs associated with the fear of a loss of trust, reciprocity or friendship (Hämäläinen and Schienstock, 2001). Shared cognitive frames and language can slow down systemic adjustments, and may even cause technological and structural network "lock-ins", making network members insensitive to external information and new perspectives (Schienstock and Hämäläinen, 2001). Moreover, high personal embeddedness can lead network members to sense that they are losing control over the situation

(Antonucci, 2001) if personal relations are used as grounds for introducing asymmetric power relationships or for free riding (Hämäläinen and Schienstock, 2001).

1.2.4. Benefits, opportunities, costs and risks of innovation networks

As the previous discussion shows, networking can be efficient for innovation management. Rational-choice economists (e.g., Williamson, 1991; Simon, 1991) propose that an organisation rationally makes decisions about the development of network relations, such that it applies economic reasoning, and tries to maximise utility and minimise associated costs. Saaty (2009) suggests that rational agents consider not only the potential benefits and costs of an alternative but also the opportunities and risks associated with that alternative. Table 1.7 summarises the aspects that firms may consider when making decisions about entering into innovation networks, as described in the literature.

Table 1.7. Aspects of the decision to enter innovation networks

Dimension	Refers to	Authors
Benefits	▪ Access to external information, knowledge and technologies needed for all steps of idea commercialisation, including product/service-related R&D ▪ Access to complementary skills ▪ Access to capital ▪ Access to new markets and faster introduction of products to the market ▪ Reduction of risk through an understanding of failed approaches ▪ Safeguarding of intellectual property rights	Ahuja, 2000; Pittaway, 2004a; Basile, 2011
Opportunities	▪ Access to knowledge spillovers (which serve as an information channel and provide insights into problems) and tacit knowledge ▪ More effective and faster access to technological breakthroughs and know-how ▪ Learning and productivity enhancements through collaborative efforts ▪ Ability to ensure legitimacy and credibility ▪ Ability to provide mechanisms to support decision making in highly specialised, uncertain and rapidly changing environments ▪ Ability to improve competitiveness through deeper economic specialisation enabled by the transfer of non-core activities to network partners ▪ Ability to receive moral support and advice from network members that facilitates the innovative project ▪ Risk sharing	Rothwell, 1992; Elfring and Hulsink. 2003; Pittaway, 2004a; Basile, 2011
Costs	▪ ***Transaction costs*** resulting from the search for appropriate network partners, negotiations, adjustments and enforcement of contracts with them ▪ ***Coordination costs*** associated with administrative support and management of multiple actors' activities, such as organising physical and virtual contacts; acquiring, transmitting, processing and storing relevant information; and business-relationship-related bureaucracy	Hämäläinen and Schienstock, 2001; Alt and Fleisch, 2000
Risks	▪ Human-related risks (e.g., opportunism, bounded	Hämäläinen and

	rationality, information asymmetry, moral hazard, resistance to change, internal conflict) ▪ Network-structure-related risks (e.g., adverse selection, principal-agent problem) ▪ Relationship risks (e.g., occasional conflicts, power asymmetries) ▪ Risks related to behavioural uncertainties (e.g., openness, fairness and trust) ▪ Reputational risks ▪ Instrumental risks related to information transfers ▪ Risks related to draining scarce resources, sustaining continuous development, maintaining flexibility, etc.	Schienstock, 2001; Hallikas et al., 2004

Despite the many benefits and opportunities that networking provides in terms of access to knowledge and resources, and enhanced legitimacy and credibility (Elfring and Hulsink, 2003), the associated risks and costs are significant. Schienstock and Hämäläinen (2001) propose that high transaction and coordination costs associated with certain organisational decisions may overwhelm their resource- and knowledge-based advantages. Network-based cooperation requires a continual search for appropriate network partners in the ambient environment, as well as negotiations and mutual adjustments. Consequently, internal factors related to the existence of networking skills and experience, and external factors related to environmental characteristics affect the functioning of networks and the amount of social capital that arises.

The external environment can be conducive or ineffective for the creation and development of networks. Individuals may have poor access to each other owing to disconnections among potentially interested parties, while a lack of overlapping knowledge structures and links, and an absence of a common cognitive frame and a shared language can reduce absorptive capacity (Nahapiet and Ghoshal, 1998) and increase transaction costs. In addition, transaction costs are influenced by the political, economic, institutional and cultural frameworks in which transactions take place (Hämäläinen and Schienstock, 2001). Transaction costs are higher in environments characterized by unstable political and economic situations, constant systemic adjustments, uncertain property rights, poor legal and enforcement systems, underdeveloped information and communication technologies, mental rigidness, conservatism, and a low level of trust (Schienstock and Hämäläinen, 2001). As such, different national cultures may have widely varying institutional environments and corresponding transaction costs.

Coordination costs are also higher when environmental uncertainty is high, means of communication are lacking, knowledge and economic activities are specialised, and a variety of cognitive frames are present (Hämäläinen and Schienstock, 2001). In the case of an unstable environment and unassociated network participants, more complicated and

costly coordination mechanisms are required. In situations characterised by rapid shifts and systemic adjustments, multiple network partners can be guided by fundamentally different motives and favour different strategies, such that the negotiation process can become more complicated and have unpredictable outcomes (Hämäläinen and Schienstock, 2001).

A number of risks caused by various factors often threaten the materialisation of opportunities and the beneficial effects of networking. For example, low levels of trust, differences in terminal and instrumental values (Rokeach, 1973), and dissimilar behavioural norms and cognitive approaches to decision making enhance relational risks of networking and, thereby, decrease social capital (Hämäläinen and Schienstock, 2001). An increase in the interdependence among network members may also expose them to the risks of the interconnected systems or parties (Hallikas et al., 2002), thereby leading to reputational consequences. Moreover, networking requires a systematic managerial approach, including the management of other risks that arise in addition to transaction and coordination costs. Thus, if the goal of networking is not significant enough or becomes irrelevant, networking can be discontinued in order to save scarce resources.

1.2.5. Network typologies

The literature identifies many different types of networks in modern economies and offers various classifications, as shown in the Table 1.8.

Table 1.8. Types of network relations

Classifying category	Types
Purpose	Information exchange or a common mission related to achieving strategic, tactical, functional (e.g., research, production, logistics, marketing) or operational goals.
Orientation of purpose	▪ **Individual:** Exchange information to solve personal professional problems and intensify learning. ▪ **Group:** Build a wider perspective on the practice in which the group is working. ▪ **Organisational:** Develop, for example, best practices, innovative solutions and new processes. ▪ **Industry and society:** Develop standards based on, for example, best practices, manuals, guidelines and regulations.
Value	Degree to which the network must deliver concrete results.
Composition	Types of actors in the network, e.g., ▪ **Vertical** networks set up to connect firms, value-adding activities or individuals along a particular value-adding chain. ▪ **Horizontal** networks set up to connect actors in particular strategic or functional areas.
Diversity of knowledge and interests of network members	▪ **Specialised:** Link representatives with similar expertise from one industry or related industries (e.g., industrial clusters, technological clusters). ▪ **Diverse:** Link representatives from different spheres with dissimilar knowledge to achieve common goals (e.g., networks that unite representatives of public- and private-sector organisations to improve the efficiency of public service provision or to combine certain public

	goods with private-sector resources to improve efficiency of commercial activities; university-industry partnerships set up to refine commercialisation outcomes).
Size	Spectrum from small to large.
Duration	Range from relationships set up to achieve short-term goals (e.g., project teams or virtual endeavours) to long-term networks (e.g., strategic alliances, joint-ventures and business associations).
Degree of centralisation	Range from one main (focal) actor to several central actors (polycentric system) to a completely decentralised structure in which all actors interact.
Level of expertise	Only experts or both experts and interested parties.
Formality of relationships	Continuum from highly informal, flexible, trust-based relations to more formal and rigid connections.
Formalization and coordination	Spectrum from occasional network-member contacts spurred by interest to formally established networks (e.g., presence of a charter, appointed managers and coordinators, formal meetings, recording of minutes).
Connectivity and reciprocity	Degree to which network members mutually interact, know each other and are bound through a relational contract.
Identity	Degree to which network members feel cohesion, trust and a sense of belonging.
Closeness and formalisation of entry procedures	Open or closed network; free or formalised membership.
Geographical dispersion	Local, regional, national, international and global networks.
Mode of interaction	Face to face and/or supplemented with virtual networks and electronic interaction, which remove the need for physical proximity.

Sources: Nassimbeni, 1998; Schienstock and Hämäläinen, 2001; Hämäläinen and Schienstock, 2001; Slotte-Kock and Coviello, 2009; Verburg and Andriessen, 2011

The literature suggests that almost every company establishes relations with distributors, suppliers, competitors or customers, as they represent important conduits of information and know-how, and are necessary for doing business. These cooperative interactions can be called "exchange relationships", as they ultimately assume reciprocity (Nassimbeni, 1998). Usually, the goals of such cooperation networks are knowledge acquisition and product development. Apart from these purposes, the literature provides other examples of networking goals. Firms may pool their resources to increase their competitiveness, thereby forming strategic networks, or they may attempt to facilitate business activities locally or globally through marketing networks (Turyakira and Mbidde, 2015). The literature distinguishes among several common forms of inter-firm business networks (see Table 1.9).

Table 1.9. Types of inter-firm networks

Inter-firm network	***Goal***
Alliances	Share risks and revenues to jointly improve individual competitive advantage.
Collaboration	Partner with others for mutual benefit.
Complementary partnering	Leverage assets by sharing them with companies that serve similar markets but offer different products and services.
Coopetition	Join forces with an actor that would normally be a competitor to achieve a common goal.

Cluster	Join forces with geographically proximate, independent but interconnected firms in a particular field (linked by commonalities and complementarities).
Open innovation	Obtain access to processes or patents from other companies to leverage, extend and build on expertise, and/or do the same with internal intellectual property and processes.
Secondary markets	Connect waste streams, side products or other alternative offerings with those who want them
Supply chain integration	Coordinate and integrate information and/or processes across a company or different parts of the value chain

Sources: Ard-Pieter de Man, 2004; Keeley et al., 2013; Turyakira and Mbidde, 2015

Table 1.9 summarises the types of networks that firms create most often and, as such, offers some vocabulary that might be used by business people in discourse about networking. As can be seen from Tables 1.4 and 1.5, companies enter into various network relationships depending on their goals, which can vary subject to the stage of the firm's development as well as other factors. Thus, while one type of network may help a firm develop initially, another may be more appropriate for other developmental stages (Slotte-Kock and Coviello, 2009).

As discussed in the Section 1.2.1, networking is particularly conducive for innovative knowledge- and technology-based companies. Thus, dynamically developing innovative companies are likely to more actively form more diverse types of network relationships than conventional business companies. This assumption requires empirical testing. Indirect evidence for this proposition can be found in Hoang and Antoncic (2001), who summarise the results of other authors' empirical observations and conclude that greater diversity in the types of network arrangements and wider geographical dispersion of high-tech firms' partners are associated with higher growth rates.

The literature also highlights another type of network, which might be called a "state". Slotte-Kock and Coviello (2009) indicate that in order to prevent the extinction of established formal and informal network relationships, it is necessary to maintain a certain degree of frequency, intensity and stability of contact. In some cases, established connections may not fade away after the initial networking goal is achieved or when interactions significantly decrease for other reasons – they may instead be converted into "sleeping ties" (Slotte-Kock and Coviello, 2009). This is particularly true of informal relationships between people with a common area of interest, often closely related to their professional practice, who have been involved in substantial interactions in the past that resulted in a common history and "culture" involving shared concepts, ideas and stories (Verburg and Andriessen, 2011). Thus, dormant relationships can be a valuable part of social capital, as they have the potential to be reactivated if necessary (Slotte-Kock and

Coviello, 2009). Given that for highly innovative companies facing a high degree of uncertainty, a broader, more heterogeneous set of social capital is of great value, they are likely to have more sleeping ties than traditional companies. This assumption also requires empirical testing.

1.2.6. Entrepreneurial networks

In this study, the focus is on networks created by entrepreneurial ventures, especially during their emergence and early development stages. Entrepreneurial networks are usually built around a start-up by entrepreneurs. As a start-up is interested in exchanging of information and attracting resources in order to design and produce goods or services, it becomes a focal actor in the network (Turyakira and Mbidde, 2015; Slotte-Kock and Coviello, 2009). Although entrepreneurial networks might comprise cooperation on both the individual and inter-organisational levels, entrepreneurs tend to establish person-to-person relations because they are seen as a medium through which actors gain access to a variety of resources held by others (Markham et al., 2010; Hoang and Antoncic, 2001; Fagerberg et al. 2006).

Interpersonal contacts are viewed as a source of business information, advice, emotional support and problem solving, with some contacts providing multiple resources. Some researchers stress that relationships can also have reputational or signalling effects (Hoang and Antoncic, 2001; Fagerberg et al. 2006), a view that corresponds to the concept of social capital (Granovetter, 1973). Thus, well-regarded individuals and organisations can recommend entrepreneurs to others to help them establishing the linkages needed to close "structural holes" in the entrepreneurial networks (Fagerberg et al., 2006; Markham et al., 2010). In the entrepreneurial community, referrals are often provided regardless of whether entrepreneurs offer reciprocal benefits to their referees. The referral mechanism is particularly important for entrepreneurial organisations because it reduces the perceived risk associated with a new venture. Moreover, an explicit recommendation from a proper network partner is sometimes the only reliable way to attract the venture capital needed to survive and grow (Batjargal, 2005).

Moreover, entrepreneurs view networks as a social context (Jack et al, 2010) in which informal interactions at the individual level are perceived as more manageable and effective than relationships at the organisational level (Fagerberg et al., 2006). Attempts to understand the usefulness of human contacts has led to the identification of the special role of the "gatekeeper" (Markham et al., 2010), which is either carried out internally by one of

the new venture's founders or externally by a person acting as a broker. The gatekeeper connects the parties and bridges the structural holes in networks (Fagerberg et al., 2006; Martinez and Aldrich, 2011).

To better understand how entrepreneurial ventures build networks, it is necessary to know with whom they establish relations as well as the characteristics of those relations. Newell and Swan (2000) state that different types of networks can be identified and that some types are more useful than others for certain purposes. In this regard, Kim and Lui (2015) suggest the following classification of networks: *institutional*, *market* and *business networks*. An *institutional network* is a group of partners in the public sector, such as government agencies, university research institutions and trade associations. Institutional networks comprise contacts that are distinct from market or industry actors, and they are linked to interests broader than those held by the company's stakeholders. Moreover, they encompass skills and objectives different from those of alliance partners. Institutional networks correspond to the *invention* side of innovation; relate to the understanding of technological advances; and help to pool knowledge, intellectual resources and development. These networks play an important role in cases of technological innovation and science-intensive product innovation (Ritter and Gemunden, 2003; Musiolik et al., 2012). Such networks are usually formal – they have an organisational structure with clearly identifiable members (i.e., firms and other organisations), which come together to achieve common aims or carry out specific tasks (Musiolik et al. 2012). Institutional networks can be formed by a firm interested in technological relationships (Ritter and Gemunden, 2003) or externally. The literature offers examples in which technological networks are initiated and governed by government agencies with the intention of stimulating innovation development at the country level (e.g., Laranja, 2012). In such cases, the firm is not a focal actor but a member of network, which means that its interests may not completely intersect with the goals of that network.

A *market network* is the group of partners with which a firm interacts in the same competitive business market, such as suppliers, customers and competitors (Kim and Lui, 2015). Market networks correspond to the *exploitation* side of innovation and relate to understanding demand in terms of product use and customer preferences. Market networks are usually formal, and they tend to be organised as projects with an interested firm as the focal actor (Hisrich, 1990; Mol and Birkinshaw, 2009).

The third type of network identified by Kim and Lui (2015) is the *business group network*, which is a group of legally independent firms that are linked through common

administrative and financial management structures. Therefore, a business group network is more stable and complex than a typical institutional or market network. Given the nature of this type of network, firms may share not only knowledge but also financial and human resources. Although this definition of a business group network is useful for understanding the networking behaviour of corporate intrapreneurial ventures, it should be extended for the purpose of the current study, which also considers entrepreneurs. According to the literature (Fagerberg et al., 2006), entrepreneurs actively seek business and professional contacts with established firms and people in their and other industries, as well as with successful entrepreneurs. Their aims in this regard are to gain knowledge about organisational issues relevant for start-ups, and to obtain legitimacy and credibility through referrals, which also give them access to capital. This type of networking, which is perceived as strategically important, usually emerges through the active creation of ties. For entrepreneurs, such ties are rarely formal, not always steady and are usually attained through the entrepreneurs' personal networks, which constitute a separate type of network.

Hisrich (1990) defines the entrepreneur's informal personal network as a group of people with whom affiliations are established through friendships or acquaintances resulting from family relations, professional experience, hobbies, sporting events, civic involvement, school and university alumni groups. This informal network, which is social in nature, is a major source of moral support. It also has significant potential to provide professional support in the form of advice and information, as well as access to resources through the referral mechanism (Hisrich, 1990). Personal social networks play a crucial role in the early stages of start-up development (Aliaga-Isla, 2014), especially in the context of emerging economies (van Staveren and Knorringa, 2007; Berrou and Combarnous, 2012), owing to their potential to reduce transaction costs, enable and reinforce collective actions, create learning spill-overs, and enforce the establishment of new, useful contacts. The latter is particularly relevant for novice entrepreneurs, for whom social capital is scarce. van Staveren and Knorringa (2007) explain that personal networking is perceived as more friendly and entailing less risk of being locked into insecure relationships, especially when the macroeconomic, social or political context is not supportive, or the environment is volatile with a lack of formal sanctions on opportunistic behaviour. Berrou and Combarnous (2012) suggest a need to differentiate among interpersonal relations depending on their strength, which reflects the amount of time, emotional intensity, intimacy (mutually confiding) and reciprocal services that characterise the tie, as suggested by Granovetter (1973). These authors suggest distinguishing among kinship, friendship, arm's-length sociability and business relations. Arm's-length sociability refers to mere

acquaintances, former colleagues and neighbours – relationships in which social commitment and personal obligations are not necessarily present. Business relations are sometimes referred to in the literature (Martinez and Aldrich, 2011) as interpersonal embedded relationships. Although these relations are economic in nature (based on the exchange of favours), they have some personal elements, such as loyalty and sympathy. Moreover, they usually imply a higher frequency of contact and a higher degree of commitment to that contact.

The networking literature emphasizes that entrepreneurs tend to build ego-centred networks (Slotte-Kock and Coviello, 2009; Berrou and Combarnous, 2012). However, their ventures operate within a broader system of ties. In summary, entrepreneurial relationships can be viewed as occurring within the setting of institutional, market, business and personal networks, the main features of which are summarised in Table 1.10.

Table 1.10. Types and characteristics of entrepreneurs' external networks

	Institutional network	Market network	Business network (professional)	Personal network (social)
Actors	Government agencies, institutions, research laboratories, trade associations	Customers, distributors, suppliers, business partners, competitors	Non-direct competitors, strategic partners, venture capitalists, consultants, service providers, training institutes, development institutes (e.g., accelerators, incubators)	Relatives, friends, acquaintances, colleagues, individual business contacts
Knowledge domain	Explicit and tangible technological knowledge	Tacit and intangible market knowledge	Tacit and intangible market and managerial knowledge derived from multiple industries	Tacit and intangible idea and product, market, organisation/people-behaviour knowledge derived from personal experience
Newly acquired knowledge	Supplements existing knowledge with previously unknown knowledge Difficult knowledge diffusion and assimilation	Extends existing knowledge; verifies market hypotheses Easy knowledge diffusion and assimilation	Improves understanding of industry, market and organisational opportunities and threats Easy knowledge diffusion and assimilation owing to similar cultures	Improves understanding of ideas, people's behaviour, opportunities and threats; verifies various hypotheses Easiest knowledge diffusion and assimilation
Nature of partnership	Moderately opportunistic due to non-profit nature of institutional partners; more open and willing to share knowledge	Most opportunistic due to competition for sales, market share in the same industry; less open and willing to share knowledge	Moderately opportunistic due to non-competitive basis of relations, buy or sell relations; modestly open and willing to share knowledge	Least opportunistic owing to trustworthy and long-term relations
Relations	Formal	Formal	Formal with a tendency to become less formal owing to increasing trustworthiness	Informal

Source: adapted from Kim and Lui, 2015, van Staveren and Knorringa, 2007; Berrou and Combarnous, 2012

As shown in Table 1.10, much of the knowledge relevant for new-venture creation is implicit or tacit rather than explicit (Nonaka, 1994). Such tacit and intangible knowledge is difficult to transfer through non-personal, text-based or codified forms of communication (Newell and Swan, 2000). Therefore, in the entrepreneurial context, the importance of person-to person direct communications in all types of networks should be stressed. As entrepreneurs simultaneously fill the roles of information collector and knowledge creator, they build personal relationships in order to ensure successful commercialisation of their ideas (Sobrero and Roberts, 2001).

In efforts to comprehend entrepreneurial networking behaviour, one must define the types of networks that might be beneficial for entrepreneurial ventures and understand the patterns that can provide advantages in relation to different types of innovation. The extant literature does not provide clear evidence with regard to the relationship between network type and innovation outcome. Although a few researchers address this issue (e.g., Ritter and Gemünden, 2003; Kim and Lui, 2015), no particular network pattern has been found to support a specific type of innovation, and no network configuration has been shown to be superior to all other configurations in relation to innovation success (Gemunden, 1996). However, researchers have found that institutional, market, business and personal networks positively affect firms' overall innovativeness and performance (e.g., Ritter and Gemunden, 2003; Mol and Birkinshaw, 2009; Aliaga-Isla, 2014).

Kim and Lui (2015) hypothesise that institutional networks are more conductive to product innovation than market networks and that market networks are more important for organisational innovation than institutional networks. Business networks are conductive for both product and organisational innovation. Isaksen and Nilsson (2011) argue that a one-sided focus on institutional networks with the aim of increasing scientific learning may be inefficient, as it does not provide an understanding of how to commercialise or otherwise implement research results. On the other hand, a reliance on experience-based knowledge accessed solely through market and business-network channels does not necessarily enhance absorptive capacity or capability building. Isaksen and Nilsson (2011) also suggest that firms that source knowledge from a variety of external sources and effectively combine institutional links (to attract science and technology expertise) with market and business links (to obtain customer-driven market insights, learn best practices and become aware of hidden problems in doing business) are the most innovative. These suppositions still require testing that takes into account the reasoning that a network's pattern and intensity must suit the individual firm's strategic-innovation aims (Gemunden, 1996),

which in turn depend on the firm's specific knowledge base (Asheim and Gertler, 2005). Moreover, a firm exists within the context of particular industry, region and country, which have certain innovation ecosystems that determine the possibilities for establishing ties (Asheim, 2007).

The difficulty of testing these hypotheses lies in the fact that firms rarely establish only one kind of network. Relationships are interwoven, such that they complement each other and have synergistic effects. In this regard, the literature demonstrates that multi-dimensional cooperation with multiple actors (diverse, heterogeneous contacts) positively influences the innovative outcome (Gemunden, 1996; Newell and Swan, 2000; Hoang and Antoncic 2001; Martinez and Aldrich, 2011).

1.2.7. Evolution of entrepreneurial networks and networking behaviour

The typology of network sources (personal, institutional, market, business) built above together with the start-up life cycle (idea, R&D in parallel with market exploration, company establishment and market exploitation) and Kim and Lui's (2015) hypotheses lead to the proposal that entrepreneurial networking is essentially an evolutionary process. As such, different types of networks are likely to play important roles at different stages of the organization's development, during which they can support the achievement of corresponding goals. In support of this observation, the literature (Uzzi, 1996; Martinez and Aldrich, 2011) demonstrates that the intensity and cohesion of cooperation with various actors varies in different stages of entrepreneurial venture development.

In reality, however, firms make different decisions in relation to building relationships that affect innovative outcomes. Therefore, whether the network evolves along an evolutionary path that follows the life cycle of the start-up is unclear. Alternatively, decisions may be past dependent, such that they are consequences of those previously adopted by the firm. According to Martinez and Aldrich (2011), strong ties have the potential to provide entrepreneurs with necessary resources early in the development of new ventures. However, such ties are costly for a new venture, and they limit the scope of opportunities to the extent that embedded ties determine a development trajectory that may not be optimal (Uzzi, 1996). At the same time, diverse weak ties increase self-efficacy and innovation. To ensure smooth development, entrepreneurs must pursue a balance between strong (embedded) ties, which offer access to resources, and weak ties, which help maintain business flexibility through continuous searches for diverse sources of information and market opportunities (Elfring and Hulsink, 2003; Martinez and Aldrich

2011). Although these studies of networks' influence on the development of an innovative company should be commended, there is still room for more research, especially in relation to the concurrent development of the start-up and networking behaviour. Another area of interest is found in the context of developing countries, which are usually characterised by unstable economic and political development that increases uncertainty in entrepreneurship. Such instability might negatively affect important networking mechanisms, such as trust.

1.2.8. Role of trust in building a business relationship

As an entrepreneur's business network is a free association of actors, trust is widely assumed to be essential (Hoang and Antoncic, 2003; Fagerberg et al., 2006; Greve and Salaff, 2003; Glanville, 2016). Trust is understood as a psychological state comprising a willingness to act based on positive expectations of the other person's intentions or behaviour (Weber et al., 2004; Kucharska, 2017). Trust allows network participants to assume that each party will behave in a predictable and mutually acceptable manner, and that they will act with honesty and integrity (Turyakira and Mbidde, 2015). These expectations reduce transaction costs (Dyer and Chu, 2003). For example, they make the monitoring and renegotiating of mutual arrangements unnecessary that leads to reduction of coordination costs. This becomes even more importnat when actors are faced with time constraints and implied conventions (Młokosiewicz and Misiak-Kwit, 2017). This is particularly true given the highly complex tasks usually solved within an innovative entrepreneurial network, as not all aspects of these tasks can be codified.

The literature views trust as an important social mechanism in networking governance that often relies on "implicit and open-ended contracts" (Hoang and Antoncic, 2003; Glanville, 2016). Trust and a commitment to meeting obligations and keeping promises are important mediating factors that may lead to successful networking. A lack of these elements may lead to a loss of reputation and ostracism (Turyakira and Mbidde, 2015). When an open relationship exists among network actors, a loss of reputation has serious consequences for the likelihood of establishing connections in the future (Newell and Swan, 2000). Smith and Lohrke (2008) distinguish between two dimensions of trust: *affective* and *cognitive*. The former, which resides at the interpersonal level in the emotional relationship domain, develops when network partners emotionally invest in relationships. Those investments result in genuine concern for the welfare of network members and a belief in the intrinsic value of those relationships. Moreover, affective trust refers to an expectation of a positive network outcome based on the network partners' constructive attitudes. In contrast,

cognitive trust can develop at the interpersonal and organisational levels, and is based on evidence of trustworthiness. This type of trust results from the positive outcomes of repeated interactions.

Trust and commitment should be proactively pursued by all parties concerned in order to ensure the sustainable development of relationships (Turyakira and Mbidde, 2015). When parties trust each other, they are likely to be more willing to engage in network activities through which additional trust may be generated understood as behavioural trust (Newell and Swan, 2000; Gillespie and Mann, 2004). This is particularly applicable in the context of entrepreneurship, where trust serves as an important driver of relationship establishment between entrepreneurs and resource providers because information and evidence regarding new ventures is lacking. Moreover, both parties fear the possibility of risk realisation: entrepreneurs risk losing a viable idea, while resource providers risk wasting resources (Newell and Swan, 2000). However, if relationships are established and go through repetitive stages of negotiation, commitment, and execution, then behavioural trust develops, which then drives the evolution of those relationships (Newell and Swan, 2000). If these interactions occur under the influence of trust and commitment, one could hypothesise that networking evolves due to the entrepreneur's ability to build relationships based on feedback from previously developed networks. This supposition is supported by research showing that serial entrepreneurs build their networks differently than novices (e.g., Aarstad et al., 2015) due to their acquired knowledge, experience and networking skills.

1.2.9. Major themes on networking found in scholarly publications

The view of networking as a new and efficient management paradigm in today's knowledge economy has generated a large number of scholarly publications. These publications have motivated several authors to review and classify the research being undertaken in the network domain (e.g., Hoang and Antoncic, 2001; Borgatti and Foster, 2003; Slotte-Kock and Coviello, 2009). Hoang and Antoncic (2003) critically evaluate more than 70 papers on the role of networks in the entrepreneurial behaviour of new ventures, and small and medium-sized enterprises. Their analysis reveals an emphasis on three essential components of networks: *network content* (the elements that are exchanged between actors classified in relation to the resource access they provide), *network governance* (mechanisms that support networks and coordinates resource flows) and *network structure* (the patterns that emerge from crosscutting ties in the network) (Hoang and Antoncic, 2003, p. 166). In their review, these authors identify two broad categories of

studies. The first group focuses on how networks affect the entrepreneurial outcome (networking as the independent variable), while the second considers how entrepreneurial processes affect network development (networking as the dependent variable). Hoang and Antoncic (2003) point out that research into how and why network content, governance and structure emerge and develop over time is lacking. Borgatti and Foster (2003) suggest that network studies can be categorised as either focusing on the causes of network structure, or on their consequences for business development and outcomes. Their observation that innovation implementation and networking are mutually reinforcing seems to add a new dimension to the current research in terms of data collection and data interpretation.

Slotte-Kock and Coviello (2009) build on these two reviews and classify network studies in relation to underlying views on networks: the *social network perspective* (explanations of network construction built on an understanding of social principles), the *business network perspective* (explanations of network construction resulting from conceptualisations of the behaviour of innovative firms, which make decisions rationally in order to achieve an optimal balance among perceived network value, its strategic importance, and the effort required to maintain it), and the *entrepreneurial network perspective* (explanations of network construction through the lens of a focal entrepreneurial firm).

These authors identify several under-researched areas in extant network studies. First, empirical efforts to track how a network develops over time are relatively rare in the context of entrepreneurship. In this regard, they refer to only a few studies as pioneering (e.g., Larson and Starr, 1993; Hite and Hesterley, 2001). These studies adopt different views on the evolution of a network's content, governance mechanisms and structure. Slotte-Kock and Coviello (2009, p. 48) point out that the "entrepreneurship literature lacks a rich understanding of when, how and why ties shift from weak to strong, social to economic, or short-term to long-term (or vice versa)… and who drives the change".

Second, Slotte-Kock and Coviello (2009) note that little research addresses the kinds of ties that are needed in the different stages of a firm's development. As Slotte-Kock and Coviello's (2009) analysis shows, the extant literature offers no consensus about how an entrepreneurial organisation should combine strong and weak ties, or how it should build its relationships in order to achieve embeddedness in social, business, strategic or other types of networks. Therefore, how to determine the optimal balance for a company's involvement in various types of networks and the most relevant structure for the different

stages of new-venture development remains unclear. Slotte-Kock and Coviello (2009, p. 48) suggest that researchers need to pay attention to understanding the connections among network interactions (ties), network structure and performance outcomes, as well as how these change over time.

1.2.10. Role of country context in networking

Section 1.2 shows that networking is a complex phenomenon, which is enabled and constrained by the actions of network members that are embedded in the wider structure of relations in which network activities are both a medium and an outcome (Michailova and Worm, 2003). Network formation, coordination and governance occur within a country's specific cultural, political, economic, business and institutional contexts (Hämäläinen and Heiskala, 2007; Shirokova and McDougall-Covin, 2012), which are largely path dependent (Ebbinghaus, 2005).

Given that cultural dissimilarities determine differences in personal values related to ultimate goals, strategies and means (Rokeach, 1973), culture might shape the structural, relational and cognitive aspects of networking strategies (Dequech, 2003). Economic, political and institutional frameworks set the context and incentives for firm and individual behaviour (Schienstock and Hämäläinen, 2001). The business environment is a scene in which parties interested in network participation are sought out, while the proximity, diversity and complementarity of their knowledge and resources, their ability to adjust cognitive frames and language, and their willingness to cooperate define opportunities and barriers to network formation and operation. As discussed in Section 1.2.4, uncertainty and the underdevelopment of the business environment increase transaction and coordination costs, as well as the risks associated with networking. This can serve as a serious argument for non-relying on networking strategies or for using particular forms of networks capable of coping with unpredictability that are not necessarily ethical (Michailova and Worm, 2003).

Scott (1995) proposes that the institutional settings of any country are based on three fundamental pillars: regulative, normative and cultural-cognitive. In the regulative domain, Hämäläinen and Heiskala (2007) suggest including explicit, legally sanctioned rules that embrace public policies, the regulatory framework (i.e., laws, regulations and collective agreements), and organisational principles and arrangements. At its core, regulation is an institutionalised expedience that imposes restrictions by defining legal boundaries, and by distinguishing between acceptable and unacceptable behaviour (Scott, 1995). It also

provides instructions on effective and contributory behaviour, and restrains actors from engaging in ineffective and malicious behaviour.

The normative domain refers to socially binding expectations and obligations, and it is morally governed, such that it allows people to make judgements about the appropriateness of behaviour (Hämäläinen and Heiskala, 2007). The cultural-cognitive domain comprises a shared understanding of the logic of actions as well as cultural rules, schemas, scripts and routines that provide people with collective meaning and a common view of the value of certain activities (Scott, 1995). This domain is the most subtle. At its core, it approaches the concept of a "national idea" in terms of uniting a country's people, influencing their personal values and ensuring that they follow the suggested meta-purpose given that it is comprehensible, recognisable and culturally supported. As such, the cultural-cognitive institutional pillar highlights the perspective that organisations and individuals might act because of country-specific ideational structures rather than by consciously following rules or norms to make rational decisions (Ahlstrom et al., 2010).

Taken together, these three pillars aim not only to control and constrain the behaviour of economic actors but also to support and empower socially beneficial activities and actors through the provision of stimuli, guidelines and resources (Scott, 1995). The ability to do so determines the quality of a country's institutionalism, which should be harmonised in terms of institutions, systems and structures, including state policies; the regulatory framework and its enforcement; governance mechanisms for managing economic and political activities; programmes to safeguard social wellbeing; systems for the development of science, technology and education; and procedures for protecting the natural environment.

In emerging economies, underdeveloped institutions and institutional constraints affect the behaviour of organisations and individuals, especially in terms of decision making and strategies for doing business (Ahlstrom et al., 2010; Shirokova and McDougall-Covin, 2012). Smallbone and Welter (2001) propose that in an unstable, weakly structured environment with a low level of institutionalism, informal personal networks often play a key role in helping entrepreneurs cope with institutional constraints that limit their abilities to attract resources and compete for orders. Michailova and Worm (2003) suggest that networking strategies express themselves differently in different countries' cultural and institutional settings. These authors argue that social networking in most emerging markets differs from Western practices. Thus, the creation and development of networks seems a

meaningful consideration in the context of a particular country. In this study, these issues are considered in the context of Russia.

1.2.11. Specific features of network building in Russia

The gaps in the literature and the research topics identified in previous sections deserve special attention in the Russian context. Russia has come a long way in the 26 years that have passed since the disintegration of the economic relationships that were inherited from the Soviet planned economy. Today, the Russian economy is based on market-driven relations, although the state continues to exert considerable influence (Ahlstrom et al., 2010). Russia also offers an example of the rapid development of entrepreneurship (Aidis et al., 2008). Private entrepreneurship in Russia, which was originally treated as a socially unacceptable endeavour (Smallbone and Welter, 2012), has recently become a highly desirable activity that is stimulated by the state. This is particularly true in the field of innovative high-tech entrepreneurship (Ahlstrom et al., 2010).

Given the pressure to be competitive in new and rapidly changing settings, Russian entrepreneurs had to establish the contacts necessary for doing business. Smallbone and Welter (2001) point out that one peculiarity of doing business in Russia is the importance of social networking and informal personal relationships, which reflects the unstable and hostile nature of the external environment and the scarcity of experience, information and key resources, especially capital (Smallbone and Welter, 2001). Academic literature on the building of business links by Russian entrepreneurs identifies country-specific forms of social networking, including *blat* (personal connections that result in preferential treatment) (Chenhall et al., 2011) and *svyazi* (useful business links) (Batjargal, 2005). Notably, the concept of *blat* has always had a negative connotation in Russia, where it was perceived as unethical and socially harmful behaviour. In contrast, the establishment of *svyazi* has long been viewed as the norm in business.

Butler and Purchase (2004) characterise *blat* as a type of informal personal tie that is an integral part of Russia's unique set of norms and standards for doing business. In the Soviet Union, which was characterised by shortages and a state-run system of privileges (Ledeneva, 1998), *blat* offered an opportunity to obtain, for example, certain services, positive and usually preferential decisions, and material benefits for which access was otherwise limited. As a rule, *blat* was based on personal ties with decision makers, usually in state-run institutional structures, corporations or large businesses (Batjargal, 2003; Chenhall et al., 2011). The higher the position individuals occupied in the relevant

structure, the higher was their social capital, as they had more potential to use their structural embeddedness to increase personal well-being through *blat*-based transactions (Batjargal, 2003). The ultimate goal of *blat*-based social networking was to serve the needs of personal consumption by bypassing the official rules covering the distribution of material welfare (Ledeneva, 1998). In Russian society, *blat*-based transactions were considered antisocial and unfair (Chenhall et al., 2011).

However, such behaviour was widespread based on the rationale that gaining access to scarce public resources was vital to economic survival and could only be achieved through personal channels (Ledeneva, 1998). *Blat*-based transactions were usually based on the reciprocal exchange of favours or access, and they were masked by the rhetoric of acts of friendship (Chenhall et al., 2011), including such terms as "sharing", "helping out", "friendly support" and "mutual care" (Ledeneva, 1998). With the transition from a state-governed economy to market-driven one, the essence of *blat* changed. In the former, money played only a minor role, as the availability of goods and services was limited and they could only be obtained through the state-controlled distribution system. In the *blat*-based systems, transactions offered non-monetary returns, such as reciprocal obligations to provide access to other distribution systems. The potential for access and reciprocal obligations served as a parallel currency that met the everyday needs of both citizens and businesses (Ledeneva, 2008). When Russia transitioned to a system of market relations at the end of 20th century, *blat*-based transactions were monetized, and they evolved into corrupt practices at the state and private business levels (Ledeneva, 2008; Ionescu, 2011). In the 21st century, progressive measures, such as changes in legislation, including anti-corruption regulations, and the adoption of Western styles of management (e.g., formal control systems in organisations, tender-based procurement systems; Chenhall et al., 2011) increased transparency. Transparency was also enhanced by the introduction of electronic means of obtaining public services (e-government solutions) in which applicants have no access to decision makers (Tolbert and Mossberger, 2017). These changes influenced informal business practices to such an extent that *blat* has almost lost its relevance as a term that describes the corrupt use of personal contacts in contemporary Russia (Ledeneva, 2008).

Although some foreign scholars studying Russia interpret the terms *blat* and *svyazi* as synonyms (e.g., Horak et al., 2018), it is worthwhile to distinguish between the two concepts. *Svyazi*, which can be understood as useful connections (Yakubovich, 2005), does not include "beating the system" of distribution (Ledeneva, 2008) or acquiring individual

benefits as necessary components. *Svyazi* refers to a type of personal informal relationship used to reduce uncertainties and provide the referrals necessary for the facilitation of entrepreneurs' access to resources (Batjargal, 2005). Personal acquaintances with "useful people" in Russia have always been considered necessary for business success, so *svyazi* can be viewed as typical for informal personal ties used for business purposes in Russia. Such ties constitute social capital.

The literature indicates that the practices of building business relations and choosing counterparties on the basis of personal ties are still widespread in Russia (Hunter, 2003; Gudkov, 2012). Contacts are sought out on the recommendations of relatives, friends, classmates and ex-colleagues (Richmond, 2003). In other words, the source of trust lies in close ties (Djankov et al., 2006) rather than in the business reputation of a person or firm (Kharchilava, 2014). When making decisions about establishing business relationships with others, most Russian managers rely on the recommendations of people whom they know and trust (Hunter, 2003).

Thus, the friendship network largely extends to the business world and it is normal to expect favours in return (Richmond, 2003). This is even more relevant for Russian entrepreneurial firms (Shirokova and McDougall-Covin, 2012). As these firms possess limited financial and human resources, the use of social connections helps to reduce transaction costs and serves as a hedge against legal, institutional and environmental uncertainties (Batjargal, 2003; Ahlstrom et al., 2010). In addition, friendly and family relations are perceived as entailing considerably less risk in case of outstanding debts and unfulfilled contractual liabilities (Jumpponen and Pihkala, 2008). Conversely, for participants in business relations with start-ups, referrals play an important role as a means of increasing interpersonal trust. For example, referrals have positive effects on investment decisions among venture capitalists operating in Russia (Batjargal, 2005). Thus, *svyazi*, which is based on recommendations, is an effective mechanism for establishing business relations in Russia.

While high levels of trust are placed in interpersonal networks (Butler and Purchase, 2004; Michailova and Worm, 2003), especially for information transfer (Batjargal, 2003), there is a lack of trust in state and public organisations. These organisations are perceived as inefficient, unreliable and unpredictable entities that cannot be trusted because they hide and distort information, partly intentionally, in order to use it in *blat* transactions (Butler and Purchase, 2008). Entrepreneurs use their *svyazi* to find personal contacts and establish personal ties with people in various organisations (especially in public ones) who can

provide access to information, answer questions, offer advice and, possibly, provide preferential assistance that can help economise entrepreneurs' time and effort. The higher an individual stands in the organisational hierarchy, the more he or she is expected to have a larger volume of accurate information. In Russia, the establishment of personal ties with people in organisations is understood as an inter-organisation linkage strategy (Hunter, 2003). This attitude is problematic for the development of systemic institutional relations in Russia, which are initiated and governed by government agencies and aimed at stimulating innovation development at the country level.

Batjargal (2003) concludes that Russian entrepreneurship is not embedded in either markets or hierarchical relations. Instead, it relies heavily on personal relationships and informal networks that are crucial for succeeding in "Russian capitalism". However, while recommendations are viewed as sufficient grounds for entering into relationships, the basis for the development of those relationships is personal business experience. If the entrepreneur has positive experiences of cooperation with a person in organisation, he or she will prefer to continue that relationship even if other organisations offer more favourable terms (Butler and Purchase, 2008; Kharchilava, 2014). This can be explained by the fact that the establishment of reliable, predictable and trusted relations is associated with transaction and coordination costs. Long-lasting relations appear to entail a relational contract as well as expectations of mutual assistance and favours. In this sense, a change of a partner is perceived as a risky and costly act.

An analysis of articles based on empirical research (e.g., Michailova and Worm, 2003; Michailova and Husted, 2003; Butler and Purchase, 2008; Batjargal, 2007; Chenhall et al., 2011) reveals several features of the construction of social networks in Russia and their differences from social networks in the West, as shown in Table 1.11.

Table 1.11. Key differences between networking in Russia and the West

Networking in Russia	Networking in developed economies
Vitally important; often a matter of survival and the only way to access rare resources	Important
Anchored at the individual level. Relations in business are established and maintained as personal and informal. In these relations, a person acts not as an official representative of an organisation but as a person who, through his position, has access to resources, opportunities to make decisions, etc.	Anchored at the organisational level. Relations are established as a part of professional responsibilities on behalf of an organisation a person represents rather than at a personal level.
Established relations are personal assets. The more connections a person has, the more valuable he/she is for an organisation. A person hoards connections gained through organisational channels (e.g., obtained as a result of participating in an exhibition on behalf of organisations) and does not always willingly share them within the organisation owing to a fear of decreasing his/her personal value and a desire to use those connections for personal benefit.	Established relations are an organisation's asset. They are institutionalised and often entered into a database to make them available for further use.

Exchanges are usually at the personal level and based on expectations of reciprocal favours. Individuals can use them to obtain benefits for themselves and for the organisation they represent.	Exchanges are usually non-personal. Although a person bears personal responsibility for the quality of relations and monitors performance to ensure fulfilment of company's obligations. He/she does not expect direct personal benefits.
Focus on long-lasting relations. Frequent exchanges help to keep relations “alive” and actual. Unsupported relationships fade away, as the chain of providing favours is interrupted.	Relations are established when needed. Exchanges are discrete in time and occur when necessary. When unsupported by personal interactions, the relationship goes into a dormant stage and can easily be renewed when needed.
Informal structures based on weak ties are more important than formal structures.	Weak and strong ties are equally present. The formalisation and institutionalisation of relations is of great importance.
Relationships with state officials and partners are built and maintained at the personal level through personal communication (e.g., congratulations on holidays, birthdays or personally important events). The management of communications cannot be transferred to other people and cannot be moved down the hierarchy, as doing so can be perceived as neglecting personal communication.	Relations are maintained at a professional level. They can be formalised and institutionalised, and they can be delegated.
Relations are often based on the recommendations of people from a close, professional circle in which trust is present.	Rational approach to the choice of contacts based on the choice of the optimal counterparty through, for example, a tender (market relations).
Extended relationships/mediated exchanges – chains of favours.	Dyad-based relationships/direct exchanges within the established connections and hierarches.
Personal and professional ties are often deliberately mixed. Professional (cold) relations are deliberately converted into personal ones (even a friendship based on common interests beyond business transactions), which are perceived as more manageable. Personal (warm) links are used to obtain faster, easier access to resources, information and recommendations. If there is a need to establish a relationship with a certain decision-making person, ways are sought to reach him through acquaintances based on personal recommendations. It is considered normal for exchanges to take place at the workplace.	Clear division between personal relationships in which exchanges take place outside the workplace, and professional contacts. Typically, these links are not mixed to avoid conflicts of interest.
If an employee through whom business with a partner company has been conducted changes his/her place of work, the relationship with that company is often interrupted or the possibility of establishing other personal relationships in that organisation is examined. However, a relationship with the company for which the contact now works can be easily established.	If an employee through whom business with a partner company has been conducted changes his/her place of work, relations with the company are continued through the employee who takes on that position. Relations with the company to which the original contact transfers can be established if that company offers better terms.
Friendship is a precondition for business relations. Friendship-based trust is likely to occur first and it may eventually develop into cognitive trust. Affective trust, rather than cognitive trust, is more prevalent when establishing long-lasting, reliable relations.	Cognitive and behavioural trusts are conditions for the development of friendship-based trust, which usually takes a long time to develop. Friendship harms business relations, as it might lead to undesired conflicts of interest.

Sources: Adapted from Michailova and Worm, 2003; Michailova and Husted, 2003; Butler and Purchase, 2008; Batjargal, 2007; Chenhall et al., 2011; Slotte-Kock and Coviello, 2009; Jack et al., 2010; Hite, 2010

Notably, informal network connections played a major role in enabling entrepreneurial activities during the transition to a market-driven economy (Smallbone and Welter, 2001) and, to a great extent, they helped resolve systemic problems arising from inefficient state institutions and poor normative and regulation systems (Ahlstrom et al., 2010). The style of

networking in Russia, which is described in Table 1.11, largely reflects historical approaches, including elements of *blat* (e.g., rational assessments of the possibility of using the acquired links to obtain personal advantages). The features of social networking in Russia presented in the table are based on studies conducted prior to 2010.

Some studies (e.g., Butler and Purchase, 2008; Ledeneva, 2008; Chenhall et al., 2011) show that the style of business networking in Russia is evolving. For example, the desire to boast of *blat*-based relations with important people and structures is largely a thing of the past, as such relations are perceived as a threat to organisations in the long term (Butler and Purchase, 2008). Moreover, more connections are being established at the inter-firm level than at the person-to-person level (Kushch, 2007), and it has become important to send a strong message to customers, suppliers, partners and the general public that all business activities are legal and that businesses will be sustainable in the long term (Butler and Purchase, 2008). At the same time, weak ties based on relational rather than cognitive trust (Butler and Purchase, 2008) continue to play an important role. However, while referrals from the trusted circle previously served as an absolute indication of key business relations, they have recently become more recommendatory in nature. In other words, the recommended person and the organisation he or she represents must typically prove their value through trustworthy actions (Ledeneva, 2008).

The extant research (Kushch, 2007; Sheresheva, 2006) shows that the structures of inter-firm relations in Russia are becoming more diversified. In addition to the historically strong structural vertical networks (Butler and Purchase, 2008), different horizontal network forms have slowly started to appear. The results of Kushch's study (2007) show that more than 60% of the surveyed companies (from a sample of 208 organisations) managed inter-firm relationships at the dual level. That is, companies often develop and implement strategies for inter-firm relationships with each partner (e.g., with each supplier or consumer) individually. Every third company applies a portfolio approach to the management of inter-firm relations, while only about 7% of companies perceive their external environment as a central network, such that they not only manage relationships with immediate partners but also work to influence their partners' relationships with third parties. However, none of the companies that participated in the study considered the possibility of creating and managing a network that was important for the industry as a whole. Kushch (2007) notes that large Russian companies are not interested in implementing a relationship-management strategy because of a lack of competition and their strong market power. In contrast, the small and medium Russian companies that took

part in the study were interested in implementing a relationship-management strategy, as they did not have sufficient market power and were forced to flexibly respond to changes in the operating environment. Although these results are interesting, it is not possible to fully evaluate their validity, as Kushch (2007) does not analyse which companies (e.g., innovative companies) use more complex and multifaceted forms of networking, and how this affects the success of their business.

As Russia continues to face rapid and dramatic shifts in the institutional environment, entrepreneurs are challenged to rapidly co-evolve as they seek to not only survive but also prosper (Ahlstrom et al., 2010). For example, Russia has recently retreated somewhat from the principles of a fully market-oriented economy due to the growing influence of the central and local governments (Ahlstrom et al., 2010). Thus, it is questionable whether the approaches based on *blat* and *svyazi* will rebound, or whether progressive changes in the surrounding business environment and society's attitude, institutional improvements, greater transparency, the availability of business education, and the absorption of Western-style management principles (Butler and Purchase, 2008; Chenhall et al., 2011) will prevent it. In general, as the above discussion shows, the mechanisms for establishing and governing business relations and networking in Russia have yet to be investigated, especially for the period since 2009.

It should be noted that the scholarly publications reviewed in this section consider firms' networking behaviour in general and that they fail to distinguish among different types of companies. Given the discussion in Section 1.2.1, which indicates that high-tech innovative companies and more traditional companies may need different types of networking with different intensities, combining different companies into a single pool for analysis can lead to confusion and irrelevant conclusions.

Thus, the author of this dissertation seeks to begin closing this gap in the literature by examining whether the mechanisms used to establish and govern business relations (including driving mechanisms, such as trust) differ depending on the type of business and its innovativeness.. As mentioned in Section 1.2.1., more traditional businesses in Western developed economies tend to use more formalised market-based or hierarchical approaches, and to use social networking based on weak ties to address non-standard tasks in atypical situations. As described in this section, Russian entrepreneurs largely relied on social networking in the early years of the Russian economy's development because of the extremely turbulent situation. Given the advancements in the institutional environment in Russia, it is natural to ask whether all types of companies still have the same pressing need

to rely on socially embedded ties that they had in the first twenty years of Russia's development. The resulting institutional changes may have led to greater use of market and hierarchical mechanisms for creating and managing inter-firm relationships.

1.2.12. Conclusions

The ultimate aims of this section in the context of the current study were to build a conceptual understanding of networking, discover characteristics of networking that can determine the occurrence of various networking patterns among entrepreneurial firms and identify gaps in literature that require attention in order to improve the understanding of networking's role in innovation.

The extant literature indicates that entrepreneurial networks are generally built around start-ups, and that they are the result of purposeful actions entrepreneurs take to discover opportunities, secure resources, and obtain legitimacy and credibility. The literature analysis led to the conclusion that although formal, inter-organisational relationships are possible within entrepreneurial networks, entrepreneurs tend to establish person-to-person relations, which are seen as more manageable and useful. The usefulness of individual contacts is explained by the fact that much of the knowledge relevant for new venture creation is implicit or tacit and, therefore, cannot be codified. Such intangible knowledge is difficult to transfer through impersonal forms of communication. As such, entrepreneurs value an informal networking style that is social in nature, and that provides professional support and moral encouragement.

The literature analysis also led to the conclusion that networking, as a special form of organisation of cooperative interaction among economic agents, attracted the attention of the scientific community at the same time as the concepts of a new knowledge economy and the digital and information era emerged. Networking – *creation of the voluntary associations of people or firms to integrate efforts and develop procedures to achieve a goal* – is seen as a widespread collaborative practice that is necessary to succeed in the new economy. It is particularly important for addressing high uncertainty and complicated tasks that require the pooling of complementary knowledge, efforts and resources. The literature emphasises that networks are crucial enablers of firm development in today's highly competitive, fast-advancing knowledge economy. At the same time, networking not only offers advantages and opportunities for business development, but also carries high transaction and coordination costs and risks. Such costs and risks can be perceived as so

high that, based on a rational assessment of such alternatives as market or hierarchical mechanisms, networking may be viewed as suboptimal.

An examination of systematic literature reviews on networks (see Section 1.2.9) suggests that the development of individual connections within an entrepreneur's network and the development of the network structure itself are insufficiently understood. However, these aspects are important for constructing a theory of entrepreneurial networking. The network literature identifies the dimensions that have to be considered when attempting to interpret the networking behaviour of entrepreneurs, including network purpose, the degree of involvement, network sources, size, density, the diversity and heterogeneity of links, frequency of communication, the relationship between networking and the business's success in terms of growth and market performance, network governance and the role of trust, network evolution, the impact of over-embeddedness, and the impact of the entrepreneurs' experience. Discussion of these dimensions in the course of interviews with entrepreneurs allowed for an understanding of the features of their networks' formation and governance (see Chapter 3).

When distinguishing between conventional businesses that existed long before the digital and information era (e.g., those dealing with the extraction and processing of material resources, and relying on traditional market-based and hierarchical approaches) and innovative businesses that are driven by high-tech knowledge-intensive solutions, a question arises: Is networking a characteristic of economic relations in new realities per se or are there characteristics of networking that are specific to businesses depending on their degree of innovativeness? Table 1.12 summarises the discussions presented in this section and maps them onto the continuum of "conventional business – knowledge- and technology-driven business" in an attempt to uncover an answer to this question. As such, it highlights the gaps in the current scholarly understanding of networking and its implications for innovation.

Table 1.12. Characteristics of networking typical of conventional and knowledge- and technology-driven businesses

	Conventional businesses ⟷ Knowledge- and technology-driven business
Market	Local, a particular client segment ⟷ Global, potential for multi-segment use
Innovativeness	Low ⟷ High
Diversity of knowledge needed	Low ⟷ High
Balance between knowledge types	Explicit, codified ⟷ Tacit, embedded in people

Number of contacts	Lower?	***Requires empirical testing***	Higher?
Network content (key actors in network)	***Requires clarification***		***Requires clarification***
Sleeping ties	Few?	***Requires empirical testing***	Many?
Goals pursued by entrepreneurs in external relationships	***Requires clarification***		***Requires clarification***
Importance of market, business, institutional networks	***Requires clarification***		***Requires clarification***
Importance of personal (social) networks	High	***Requires empirical testing***	Also high?
Network structure and balance of cooperative relationship types	Vertical, supply chain	***Requires empirical testing***	Integration? Horizontal collaboration?
Balance of network-governance mechanisms	***Requires empirical testing***		
Role of social networking in governance of relations	***Requires clarification***		***Requires clarification***
Interpersonal trust	Level depends on country-related cultural specifics	***Requires empirical testing***	The same level?
Role of interpersonal trust	***Requires clarification***		***Requires clarification***
Evolution of networks	***Requires clarification***		***Requires clarification***
Evolution of networking behaviour as entrepreneurial experience increases	***Requires clarification***		***Requires clarification***

The section highlights the importance of trust and commitment as driving mechanisms of networking. An understanding of the concept of trust is particularly important for new ventures. In the absence of previous positive experiences that can serve as a basis for cognitive trust, novice entrepreneurs must build affective trust with their partners in order to establish good relationships. They can do so either by demonstrating a high degree of commitment or using referrals, or both. The literature suggests that trust can develop as a relationship progresses. Moreover, the skills needed to build relationships based on trust develop as entrepreneurs gain experience. This observation allows for the assumption that networking behaviour can evolve as entrepreneurs gain experience, which in turn implies that the patterns of networks built by novices and serial entrepreneurs should differ.

This section accentuates the view that networking is a complex phenomenon that can be meaningfully studied in the context of country's specific cultural, political, economic and

business environment, and the institutional factors that are essentially path dependent. The literature offers evidence that entrepreneurs in the highly unstable and unpredictable environments that characterise emerging economies rely more on soft methods of securing deals, such as referrals and recommendations.

The Russian context was used to illustrate the fact that the networking behaviour of entrepreneurial firms is highly embedded in the country context based on the results of available studies that were conducted before 2010. In this regard, this section highlights features of the Russian approach to social networking that distinguish it from the Western approach. As a result of its history, Russia is characterised as a country with a low level of trust between people and low confidence in state institutions, which results in the adoption of flexible networking approaches based on weak, personal ties. However, given that society, the economy and the corresponding institutions in Russia are developing rapidly, the transformation of the business environment might have an impact on networking behaviour among Russian entrepreneurs. Thus, there is a clear need to gather up-to-date empirical data, which will allow researchers to draw conclusions about the current state of networking in Russia. Taking into account the assumption that traditional businesses may need a different type of networking than knowledge- and technology-based businesses, it seems reasonable to consider the networking of modern Russian entrepreneurial organisations based on their degree of innovativeness. Moreover, the assumption that the absorption of Western-style management principles might change Russian entrepreneurs' networking strategies requires empirical evidence. Any results in that regard will have a wider scope of interpretation than solely in the context of a transitional economy.

Given the importance of country context in entrepreneurs' choice of networking strategies, and taking into account the purpose of this study (i.e., to explore the role of networking in the company's innovation process), it is necessary to consider concepts that organically unite innovation and networking and highlight key aspects of the national context that mediate the use of networking as a facilitating mechanism for innovation.

1.3. National innovation system

This section presents a review of the literature on innovation systems, and considers their manifestations on national and regional levels. It begins with a comparison of the definitions of national innovation systems (NIS) given by different authors and considers of the role of networking in an NIS. The section also highlights the key elements of an NIS and identifies the challenges facing a country wishing to build an innovative system capable of supporting the development of innovation. The next part of the section is devoted to an analysis of the literature dealing with the governance of the innovation system. As a result of modern economic and political structures, innovation processes in most countries are increasingly implemented and governed at the regional level. Therefore, the concept of a regional innovation system (RIS) is also introduced. At the end of the section, the key actors in the innovation system as well as the framework conditions and infrastructure that must exist for the development of innovation are considered. The section concludes with an explanation of the findings in relation to this study.

1.3.1. National innovation system and the role of networking

A number of scholars (e.g., Niosi, 1993; Cooke et al., 1998; Sharif, 2006; Godin, 2009; Soete et al., 2009) who discuss the history of the national innovation system (NIS) concept agree that it emerged between the end of the 1980s and the middle of the 1990s owing to the work of Freeman (1987), Lundvall (1992) and Nelson (1993). By placing this concept into a common theoretical domain with such conceptual frameworks as the knowledge-based economy, the digital and information era, innovation, and the new theory of the firm (Godin, 2009), and by emphasising that the innovative activity of firms in the new economy inherently occurs in the national institutional context, these authors formulated complementary definitions of the concept of NIS, as presented in Table 1.13.

Table 1.13. Key definitions of the concept of NIS

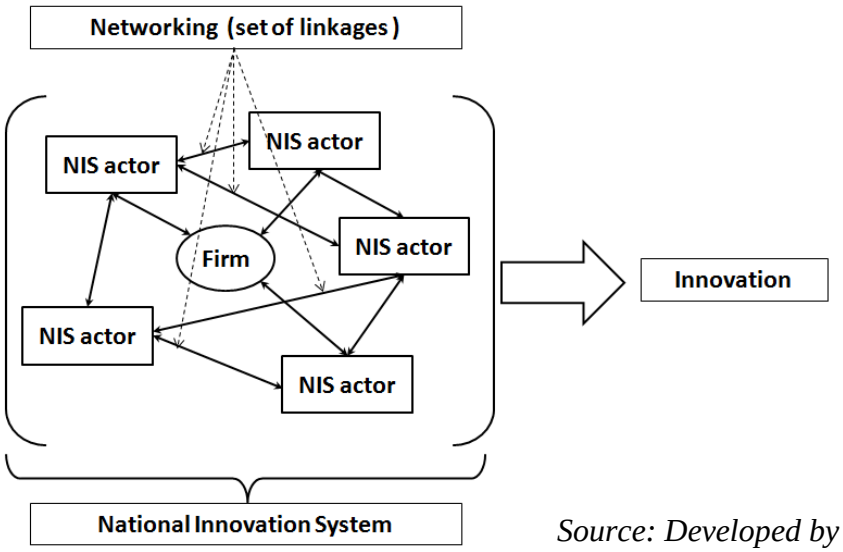
Definition	Author
"The network of institutions in the public and private sectors whose activities and interactions initiate, import, modify and diffuse new technologies"	Freeman (1987, p. 1)
"The elements and relationships which interact in the production, diffusion and use of new, and economically useful, knowledge ... and are either located within or rooted inside the borders of a nation… The narrow definition would include organisations and institutions involved in searching and exploring – such as R&D departments, technological institutes and universities. The broad definition… includes all parts and aspects of the economic structure and the institutional set-up affecting learning as well as searching and exploring…"	Lundvall (1992, p. 12)
"There is, first, the concept of a national system innovation itself… Consider the term "innovation." …we interpret the term rather broadly, to encompass the process by which firms master and get into practice product designs and manufacturing processes that are new to them, if not to the universe or even to	Nelson (1993, p. 4-5)

the nation… Then there is the term "system."… Rather the concept is of a set of institutions whose interactions determine the innovative performance, in the sense above, of national firms… Rather, the "systems" concept is that of a set of institutional actors that, together, plays the major role in influencing innovative performance."	

The authors agree that to enable innovative processes, the institutional settings of an NIS should efficiently allow for a complex set of relationships conducive for effective flows of technology and information among actors in the private and public sectors. To these definitions, Metcalfe (1995) adds the perspective of the government's role, suggesting that the government should enhance opportunities for commercialisation through framework policies, infrastructure developments and other mechanisms. Metcalfe (1995, p. 38) proposes that an NIS is "a system of interconnected institutions … which jointly and individually contribute to the development and diffusion of new technologies and which provides the framework within which governments form and implement policies to influence the innovation process". He suggests that the national component embraces not only the technology-policy domain specific to a particular company but also a "shared language and culture which bind the system together, and form the national focus of other policies, laws and regulations which condition the innovative environment" Metcalfe (1995, p. 38). Edquist (1997, p. 14) suggests an even broader view of innovation system that includes "all important economic, social, political, organisational, institutional and other factors that influence the development, diffusion and use of innovations". The proposed approaches, which are closely correlated with the general view of institutionalism proposed by Scott (1995) (see section 1.2.10), define the scope of activities in which institutions should be involved, especially in terms of innovation expansion through, to a great extent, technology development.

The novelty of the increasingly complex and encompassing NIS concept (Niosi, 1993) lies in the fact that it does not simply view the institutional environment as a passive context of economic activity that companies should take into account when doing business. It introduces a new, distinct element of the firms' business environment – a complex set of relationships among NIS actors, who produce, distribute and apply various kinds of knowledge to achieve innovation and technical progress (Niosi, 1993; OECD, 1997). Thus, instead of depending on institutional settings (see Section 1.2.10), networking becomes an important intangible element of a firm's business environment as a media that ensures the interaction and interconnectedness of actors. Innovation is simultaneously seen as the outcome and the purpose of NIS actors' interactions (see Figure 1.12).

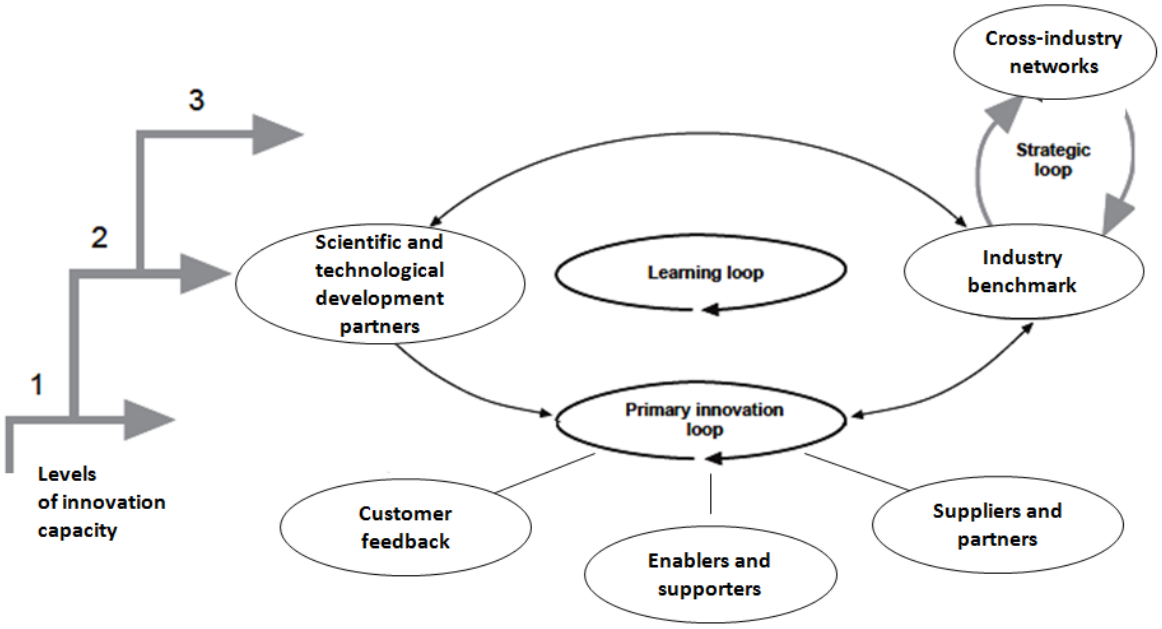
Figure 1.12. Role of networking in NIS



Source: Developed by the author

The NIS concept emphasises the importance of linkages among the actors involved in innovation. Firms' innovation abilities, which result in the innovative performance of a country, "depend to a large extent on how these actors relate to each other as elements of a collective system to create knowledge, develop technologies and use them for the purposes of commercialisation and achieving economic progress" (OECD, 1997, p. 9). There are numerous actors without which innovation would not be possible. However, as the introduction of products and services to the market is ultimately the firm's responsibility, an understanding of how firms build relationships with other actors is of particular interest. The patterns that are typical of different types of enterprises attempting to attain the different levels of innovation capacity needed for conducting business are presented in Figure 1.13.

Figure 1.13. Levels of firms' innovation capacities



Source: Adapted from OECD, 1999

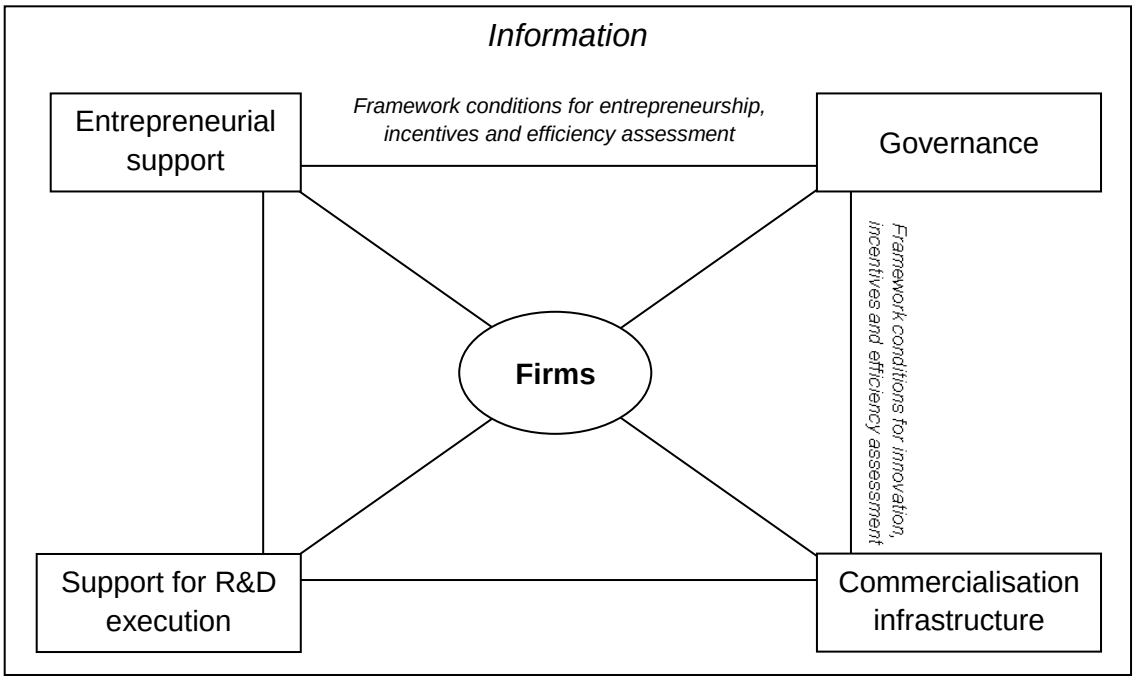
The first level can basically be seen as implementation of a strategy of learning by doing (e.g., producing and selling products/services to customers) and learning by using (e.g., economic exchanges with suppliers and partners) (Cooke et al., 1997). The more advanced second and third levels can be characterised as learning through interaction, which does not follow from primary business needs but has to be intentionally undertaken in order to develop the firm's competitive capabilities. Cooke et al. (1997) propose that learning is not only linked to a certain institutional structure but also requires means, incentives and the cognitive abilities of individuals or firms.

With regard to which scale of networks best supports innovation systems, networks can be analysed at different levels, such as the cluster, industry, regional, national, continental and global levels (Cooke et al., 1997; Asheim, 2007; Sæther et al., 2011). Given the country-specific and often historically conditioned macroeconomic and regulatory contexts; cultural traits (i.e., a common language, shared cognitive mechanisms and irrational decision-making schemes based on traditions); path-dependent managerial approaches; and distinctive achievements in the spheres of science, technology and education at the national level, it seems relevant to study principles of innovative interactions in a given country (Gemünden et al., 1996; OECD, 1997; Cooke et al, 1997) (NIS as the "core" of a country's specific innovation system, Lundvall, 2004). However, the extant literature (Sæther et al., 2011; Isaksen and Nilsson, 2011) indicates that the firms' opportunities to establish ties can be better understood if considered at the regional level. This implies the existence of regional innovation systems (RIS).

1.3.2. Key elements of the NIS

Extant research indicates existence of several interrelated fundamental blocks that influence the creation and functioning of a national innovation system (NIS), as well as its success. It is important to ensure that these units are indeed interconnected, as shown in the Figure 1.14, since only in complex the system can operate effectively.

Figure 1.14. Generalised model of a national innovation system



Source: Adapted from OECD 2011, p. 18

The compositions of these blocks are the key for any country wishing to develop a NIS that is conducive to innovation and capable of supporting continuous development. The first challenge is to ensure the emergence of a wide range of enterprises of all sizes with strong incentives to succeed in the face of competition by using innovation to produce goods or services for both domestic and international markets. Directly linked with this challenge is the task of creating an effective system for supporting and stimulating the growth of small and medium-sized enterprises, especially in high-tech and medium-high-tech science-intensive industries. This system must encompass both supply and demand. The former (the first generation innovation policy starting in the 1980s) relates to building the infrastructure necessary for business development and introducing mechanisms to provide access to financial resources, which is possible only in environments characterised by a favourable investment climate, and a relevant legislative and regulatory framework. This approach is supportive for "Science, Technology, Innovation" (STI) trajectory of innovation (Isaksen and Nilsson, 2013) aimed to commercialise research results (technology push, Rothwell, 1994). The latter (the second generation innovation policy developed in the 1990s) concerns providing support for the development of new products or services to specific markets (market pull, Rothwell, 1994) thus stimulating demand ("Doing, Using, Interacting" (DIU) trajectory, Isaksen and Nilsson, 2013).

The implementation of supply-side policies focused only on supporting R&D and the development of specific technologies is no longer sufficient (Isaksen and Nilsson, 2013). A

more systemic strategy must be applied that takes into account the many factors and effects arising from the interactions of NIS actors that influence firms' innovation performance. Well-designed demand-side policies are not only less expensive but can also direct support measures in the right direction. They can be supplemented with the introduction of tax incentives to reduce the cost of innovative production, the opening of markets to competition, the establishment of innovation-inducing standards and smart regulations, and improvements in public-procurement systems implemented both at national and regional levels. Isaksen and Nilsson (2013) propose that firms that combine the science-based STI and the experience-based DUI modes of innovation achieve better results in terms of product innovation than those that use only one of the two. As such, a central issue for policy making in modern conditions is to ensure an effective combination of the STI and DUI approaches in the innovation system rather than merely supporting R&D activities or user-driven innovation processes (Isaksen and Nilsson, 2011). In the context of globalisation, this is a necessary condition for unleashing innovation, and for maintaining national wealth, competitiveness and economic growth (OECD, 2010).

The transition from first- to second-generation innovation policies has resulted in the strengthening of regional innovation policies. This is based on the reasoning that innovation processes are stimulated by location-specific resources and demand. As these resources and demand vary by region, one set of policy instruments is unlikely to suit all regions (Isaksen and Nilsson, 2013).

Another key task when building an entrepreneurial-support system is to foster efficient ownership, a healthy competitive environment, opportunities for cooperation, and ideological and technological enrichment among entrepreneurs. No less important is ensuring that business ventures have development opportunities in the global market, including access to technological transfers with high-tech business leaders and investment deals with global venture investors (Golichenko, 2011).

The second challenge is to ensure not only the inflow of outstanding talented people into the NIS but also that the NIS encompasses sufficient number of highly qualified, effective personnel capable of producing knowledge through the scientific fundamental and applied research that typically leads to technological progress in the form of world-class inventions and technological spillovers. At the heart of this challenge lies the allocation of adequate funding for R&D, research infrastructure and education, as well as the building of effective mechanisms for encouraging national scientists and engineers to interact and cooperate among themselves, as well as with the international scientific and technological

communities. The aim of such cooperation is to augment innovative outcomes by capitalising on synergies and knowledge externalities.

As the presence of advanced knowledge and technology does not automatically lead to introduction of new or improved products and services to the market, the third challenge is the most important from the perspective of innovative development. This challenge relates to providing relevant methodologies, infrastructure, supportive institutions, legal mechanisms, dedicated policies and favourable conditions for enhancing technology absorption, innovative capacity building, networking and clustering, all of which are needed to use R&D as a source of innovative development. An effective commercialisation system is necessary to address this challenge. Such a system must include a sufficient number of institutions and specialists as well as appropriate legal and financial frameworks. In particular, effective links must be established among actors from the R&D and the business sectors, as well as with other stakeholders.

The fourth challenge is to introduce an effective governance system that, based on the principles of transparency and rule of law, ensures a strategically sound innovation policy and a wide array of complementary public policies[2]. This governance system must create a network of interrelated institutions and infrastructure organisations, coordinate the interactions of NIS participants through institutional arrangements and incentive structures, attract and allocate necessary resources, ensure the harmonious functioning of the NIS across regions and sectors, improve the co-ordination and coherence of policies and different layers of government, define the societal challenges that need to be addressed on a domestic and global scale, and set priorities for resource allocation. It must also measure innovation in a way that ensures efficiency. These functions are typically assigned to a science, technology and innovation (STI) governance body, which is often a collegial construction involving governmental organisations, public/private partnerships and non-governmental organisations (NGOs) (OECD, 2010). The governance system must also act as a catalyst for mobilising NIS actors and provide mechanisms that reduce innovation risk. Moreover, a country's government should serve as a guarantor of legitimacy, and political and financial stability inside the country, while also by means of its foreign policy actions provide support for a smooth integration of national NIS into the international innovation system.

[2] Such policies may include monetary, budgetary, competition, trade, financial, education, training, research, industrial, regional, social, health, environmental and judicial policies (OECD, 2015).

The fifth challenge, which relates to the context necessary for the development of an NIS, is the organisation of an information space that ensures timely information exchange among all of the system's participants, as well as objective reporting on actions, problems and achievements for external stakeholders, including the international community. In this regard, information support is intended to ensure the transparency of processes and decision making, and to allow for public participation in a broad discussion of development priorities, as issues related to NIS creation are directly related to the use of the state budget.

The sixth challenge is the need to ensure the co-evolution of national policies, institutions, industry, science and technology (Isaksen and Nilsson, 2011). Given that institutions and policies define common norms, rules, practices, regulations and laws that guide and constrain the behaviour of actors (Scott, 2013), innovation processes suffer if the system functions poorly, lags behind overall development or does not provide proactive stimulus for innovation. Isaksen and Nilsson (2011) identify causes of systemic failures that are related either to the components of the innovation system (that are non-existent or ineffective) or to the functioning of the system (e.g., inadequate or broken linkages creating barriers to efficient knowledge exchange and learning among NIS actors). The broad definition of linkages in the literature includes flows of knowledge, information, investment funding, authority, resources and human capital. Such exchanges can occur in different contexts, such as networks, clubs, associations, forums and partnerships that differ in terms of their degree of weakness, formality, regularity, intensity, density and structure (hierarchical, heterarchical (network form), polycentric (bottom-up) or dualistic) (Cooke et al., 1997; Tödtling and Trippl, 2005).

1.3.3. Role of public governance in the development of innovation systems

When considering the development of innovation systems, particular attention should be paid to the roles of public governance, as state intervention does not necessarily improve welfare, especially with respect to innovative activities (Metcalfe, 1995). Efficient governance depends on certain qualities, including legitimacy, coherence, stability, the ability to adapt, and the ability to steer and give direction (Palmberg and Lemola, 2012, p. 472). In essence, state should act as a catalyst for the development of innovation systems by fostering interactions among actors, acting as a strategic visionary, serving as a guarantor of minimal risks, and redirecting resources to corrective measures in problematic areas where market mechanisms are either not yet mature or flawed.

Based on an analysis of best practices, the OECD (2017) highlighted certain areas that require effort and attention from state officials in relation to public procurement and innovation. The OECD's findings can easily be extended to the broader context of innovation-related government activity (see Table 1.14).

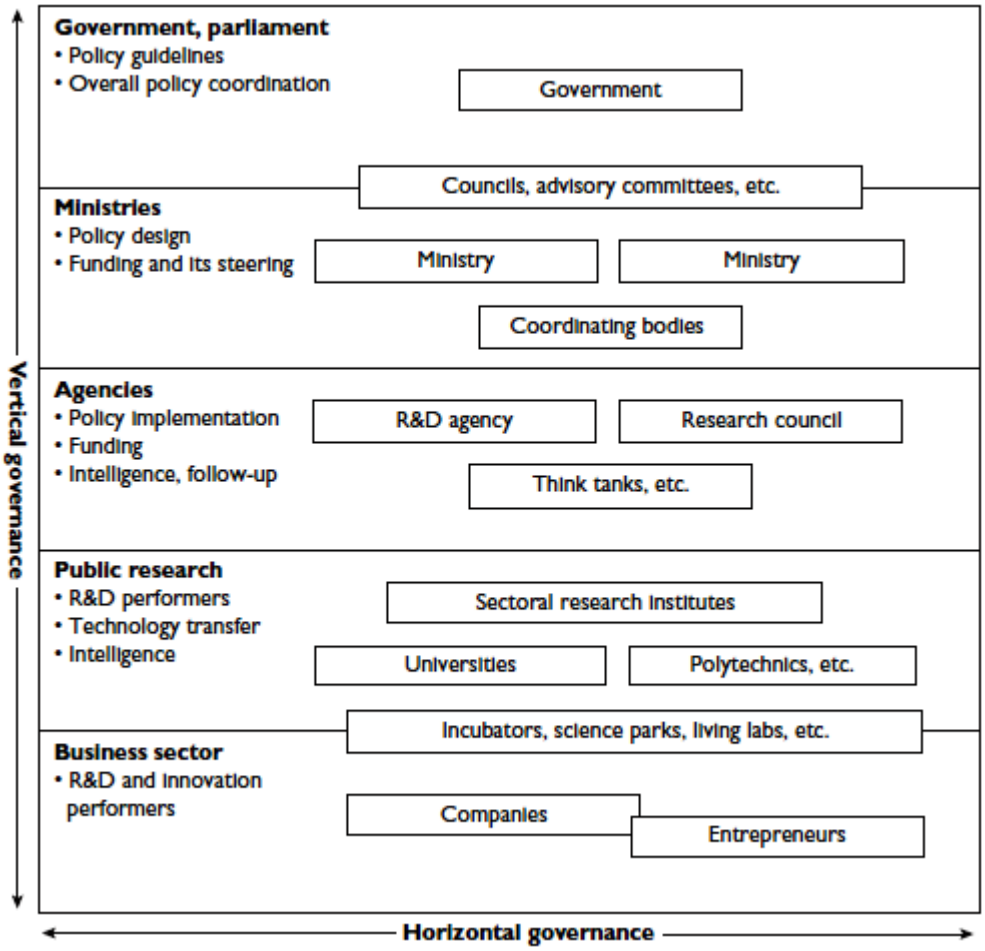
Table 1.14. Key areas for government action

- Development of strategies with defined targets within national, subnational and regional innovation policies.
- Establishment of a legal framework, including definitions, guidelines and templates to facilitate its implementation.
- Designation of "transformational" leaders with specialised knowledge who can establish skilled, multidisciplinary teams, so as to encourage sound management and leadership in administration.
- Creation of "intermediaries" – innovation agencies that can help increase the effectiveness of interactions among actors in the innovation system.
- Allocation of sufficient budgets, funds and other financial incentives, as a lack of financial support is one of the main challenges in innovation development.
- Provision of training aimed at building the capabilities and skills of innovation-system actors, and the establishment of multidisciplinary teams and competence centres focused on innovation development.
- Publication of good-practice cases, creation of a dedicated knowledge-sharing platform, and/or the hosting of workshops and seminars to share and build the success of innovative projects by engaging stakeholders in the early stages.
- Introduction of risk-management measures to reduce possible losses and damages, and increase trust within the innovation system.
- Introduction of standards, methods and quality-certification systems, and the use of standardisation as a catalyst for innovation.
- Creation of appropriate information technology (IT) tools, including e-communication, e-procurement and e-government services, aimed at increasing transparency, easing control and measurement, and allowing for risk assessments in order to implement necessary corrective measures in a timely manner.

Source: OECD, 2017

Palmberg and Lemola (2012) suggest that a country's innovative activities are not governed by the state alone but by the state in cooperation with other stakeholders spanning both horizontal and vertical levels, as presented in Figure 1.15.

Figure 1.15. Typical governance structure of an NIS



Source: Palmberg and Lemola, 2012, p. 472

The extant literature distinguishes among several key governance functions (Bergek et al., 2008; Hillman et al, 2012; Hämäläinen and Heiskala, 2007; see Table 1.15).

Table 1.15. Governance functions

Function	Description
Knowledge development and diffusion	Generating breadth and depth in the innovation system's knowledge base, technology-development forecasts, and technology transfers; diffusing and combining knowledge from different sources and of different types (e.g., scientific and applied knowledge, patents).
Influence on the direction of search	Creating incentives and/or pressures to enter the innovation system, and directing activities towards certain innovation-system areas that require contributions (e.g., certain technologies, applications or markets).
Entrepreneurial experimentation	Probing new technologies and applications; unfolding a social learning process to reduce uncertainty.
Market formation	Identifying market opportunities through trend assessments, forecasts and foresight; assisting in the development of niche markets; stimulating demand for innovative products; brokerage.
Legitimisation	Providing assistance with social acceptance and compliance with relevant institutions; creating a legislative base for the implementation of new technological solutions (e.g., in the field of safety, energy saving, environment protection, etc.).

Resource mobilisation	Mobilising competence/human capital through education in specific scientific and technological fields as well as in entrepreneurship, management and finance (including venture capital); finding business opportunities for firms through diversification, collective learning and structural adjustments.
Development of shared cognitive frames and strategic vision	Facilitating a systemic vision and a learning-oriented organisational culture; developing new mental paradigms and positive incentives for change; coordinating information flows among the private sector, the public sectors and key stakeholders through open dialogue.
Development of positive externalities	Ensuring the interconnectedness of different parts of the innovation system, and between the system and its external environment to fulfil other socially important functions.

Sources: Bergek et al., 2008; Hillman et al, 2012; Hämäläinen and Heiskala, 2007

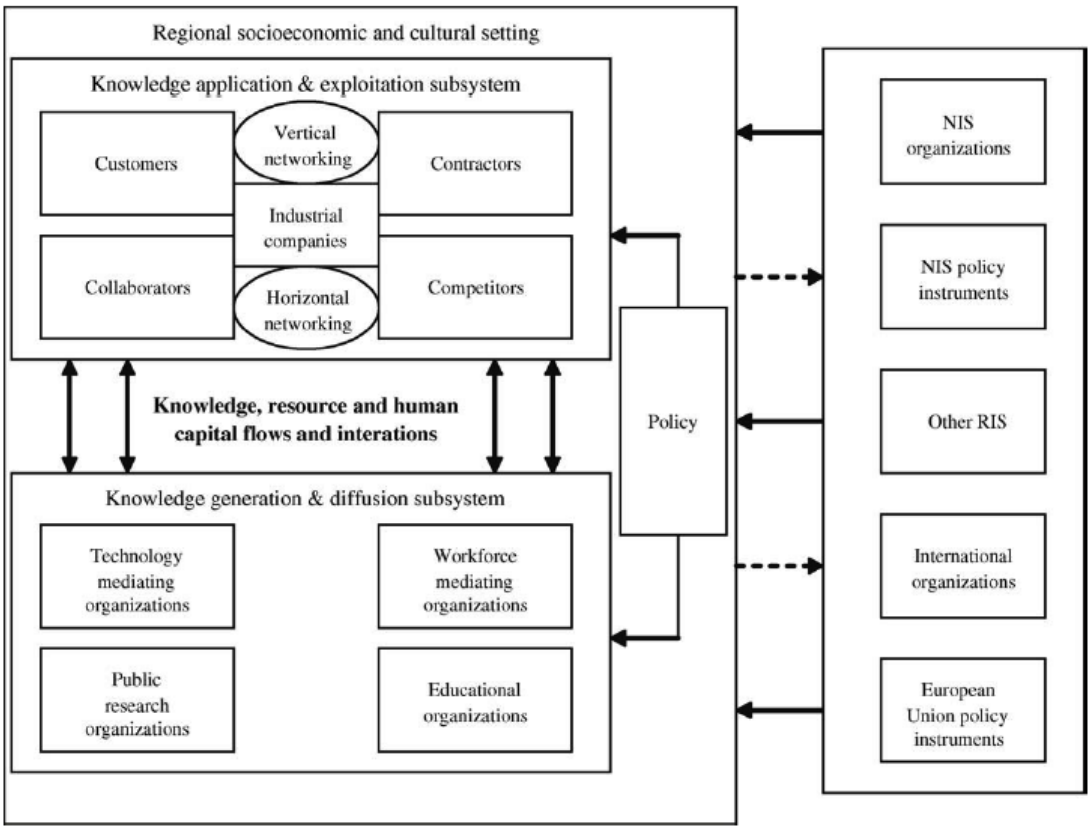
1.3.4. Regional innovation systems

In terms of operationalising the NIS framework being a general model of a context conducive to innovative development, a stream of scholarly publications (e.g., Cooke et al., 1998; Isaksen, 2001; Morgan, 2004; Tödtling and Trippl, 2005; Asheim, 2007; Isaksen and Nilsson, 2013) proposes the concept of regional innovation systems (RIS). Cooke et al. (1997) explain the emergence of the RIS concept from two perspectives. The *regionalisation* perspective sees a region as a separate unit with its own jurisdiction, capacities and competences. In this perspective, a region has some degree of autonomy to develop policies and manage local systems. It also possesses the capacity to finance investments in innovative infrastructure. The *regionalism* perspective is related to the local cultural environment (evident in, e.g., shared norms, routines, conventions and informal social networks) that underlies a certain region's systemic potential.

Geography matters because most modern economic relations are based on the spatial principle (Doloreux and Parto, 2005), where regions and municipalities "seek to influence the trajectory of economic development in their respective jurisdictions" (Morgan, 2004, p. 4). Cooke et al. (1998, p. 1573) define a region as "a territory less than its sovereign state, possessing distinctive supralocal administrative, cultural, political, or economic power and cohesiveness, differentiating it from its state and other regions". Tödtling and Trippl (2005) suggest considering innovation processes at the regional level, reasoning that the knowledge and information exchange that enable innovation process are often spatially bounded. Regional interactions can minimise transaction and coordination costs among firms (Cooke et al., 1998). Moreover, given the significant amount of tacit knowledge, these interactions require intensive personal contacts based on trust and mutual understanding, which are facilitated by geographical proximity as well as shared cultural, social and institutional contexts (Asheim, 2007).

Due to historical trajectories, regions differ with respect to their industrial-specialisation patterns, knowledge and resource bases, as well as their infrastructure, which together determine their innovative capacity and capabilities (Cooke et al., 1997; Asheim, 2007). Therefore, the same approach is unlikely to efficiently support innovation in different territories (Oughton et al, 2002). Consequently, even if a general frame for the development of innovation is built at the state level, the actual work must occur at the regional level. As such, national policies and instruments should be supplemented with policies and instruments at the regional level. Isaksen and Nilsson (2013) suggest conceptualising an RIS in terms of three subsystems: the production structure (the firms in the main industries or clusters in the region); the knowledge base (e.g., universities, research institutes, firms' R&D departments, training organisations); and the support infrastructure, including a number of often publicly funded organisations that are entrusted to support the economy and the system in various ways. Tödtling and Trippl (2005) provide a visualisation of the RIS structure (see Figure 1.16), stressing that it is a subsystem of the NIS. The structure has two main components: (1) knowledge application and exploitation, and (2) knowledge generation and diffusion (embracing mediating and support organisations). Both of these components exist in the regional socioeconomic and cultural setting, and they are influenced by various policies.

Figure 1.16. A model of a regional innovation system



Source: Tödtling and Trippl, 2005, p. 1206

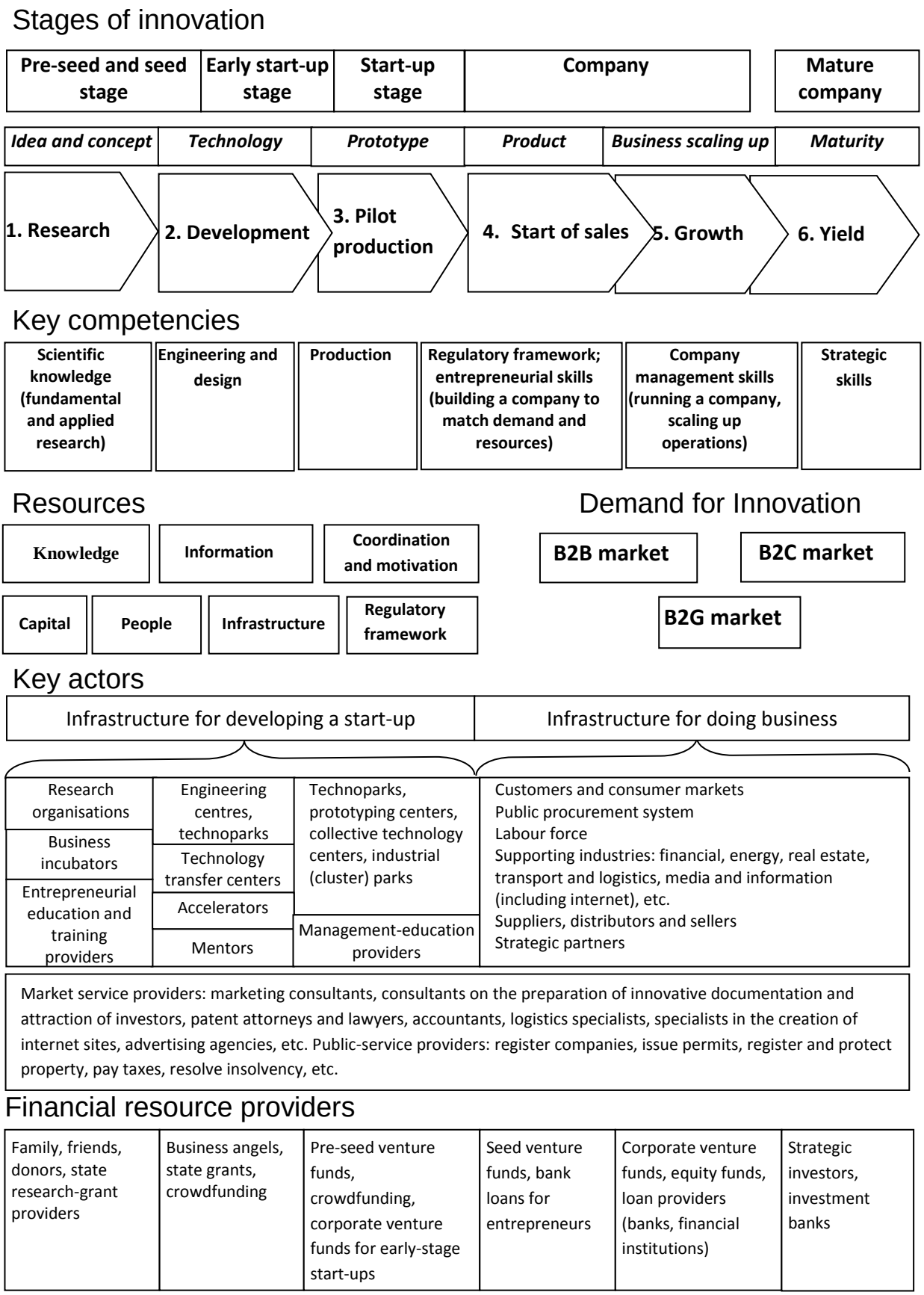
Tödtling and Trippl (2005) emphasise that RISs exist due to intense, interactive relationships within and between internal subsystems and the external environment with the purpose of facilitating a continuous flow and exchange of knowledge and resources, including financial resources and human capital. An RIS is an open system that is far from self-sustaining. On the one hand, it is affected by and reacts to the challenges of the external environment. On the other hand, it establishes external links in order to gain access to ideas, knowledge and technologies that cannot be generated within the limited context of the region (Tödtling and Trippl, 2005).

The RIS concept is particularly relevant and practical when discussing policy implications (Isaksen, 2001). Depending on whether innovation is an organic, self-actualising process in a region due to the presence of innovative clusters of firms or perceived to be consciously induced through a special set of actions in the context of less favoured regions (Morgan, 2004), different policies, instruments, institutional and infrastructural solutions should be implemented (Oughton et al, 2002). However, all regional innovation-support programmes have the stimulation of learning and knowledge exchange in common, as well as the introduction of proactive policies to "create new 'social capital' or capacity for associational, high-trust, networking practices" (Cooke et al., 1997, p. 480).

1.3.5. Key actors in innovation systems

Tödtling and Trippl (2005) suggest that firms may successfully innovate regardless of whether they belong to a regional innovation system as long as they are able to find relevant competences and actors with which to interact in national or international innovation systems. Based on the definitions of NIS provided by Freeman (1987), Lundvall (1992) and Nelson (1993), who mainly consider the innovation process in the context of technological and product innovation, it is necessary to identify key actors at different stages of the innovation process: creating new knowledge; and transferring and transforming that knowledge into new technologies, products and services that are then consumed by society (Godin, 2009). Based on the model developed in Section 1.1.3, which represents the invention-commercialisation process (see Figure 1.5), we can develop a map of key innovation-system players at each stage of the innovation process (see Figure 1.17).

Figure 1.17. Map of key actors in innovation systems



Source: Developed by the author

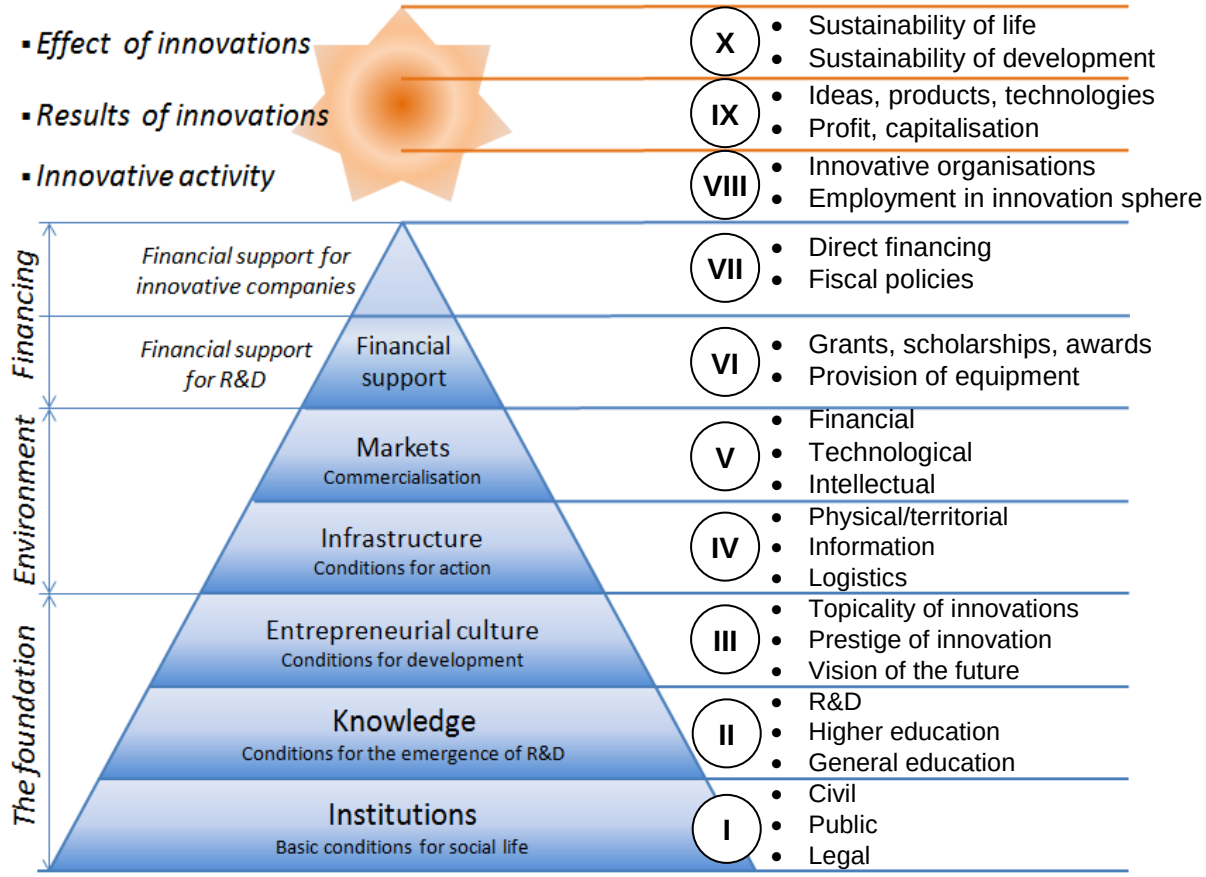
To enable effective innovation process, state policies, instruments and enabling mechanisms should lead to the formation of key elements and the involvement of key

actors (Lundvall, 1992), as shown in Figure 1.17. As discussed in Section 1.2, not all companies need innovation to the same degree. A key question then arises: Which of the actors presented in Figure 1.17 are typical members of the networks of firms as we move along the continuum from conventional to highly innovative firms?

1.3.6. Framework conditions and infrastructure

In order for innovations to arise and develop, an innovation environment must be created that encompasses many factors and framework conditions (as shown in Figure 1.18). The responsibility for the development of most of these factors and conditions lies with the state.

Figure 1.18. The innovation pyramid model



Source: Karmyshkin, 2015, p. 16

The structure of a favourable innovation environment can be represented as a six-layer pyramid. At the very bottom are the basic institutions of the state — civil, social, legal and others. They provide a common set of common rules and practices with the goal of building a well-functioning state mechanism in which all members of society are provided with the same fair living and working conditions.

The ability to generate new knowledge is an indispensable condition for a country's innovative development. This requires literacy, education, research competencies, infrastructure and a scientific culture that contributes to the emergence of innovation. Without this important component of innovation system, it would only be possible to replicate innovations made in other locations.

The presence of an entrepreneurial culture provides an opportunity to commercialise inventions in early, high-risk stages. From this point of view, it is extremely important to ensure that society has an appropriate view of innovative entrepreneurship as an important driver of innovative development for the country as a whole.

The infrastructure layer includes physical, informational and other structures and systems, as well as networks and various interrelations. All of these components provide NIS participants with conditions that support work and generate results.

The market layer covers financial, technological, intellectual and other markets in which prices for innovative tangible and intangible outcomes are determined. Innovators, investors and strategic partners meet each other as sellers and buyers in these markets. Finally, the topmost layer represents mechanisms for stimulating innovation through, for example, financial and fiscal support measures.

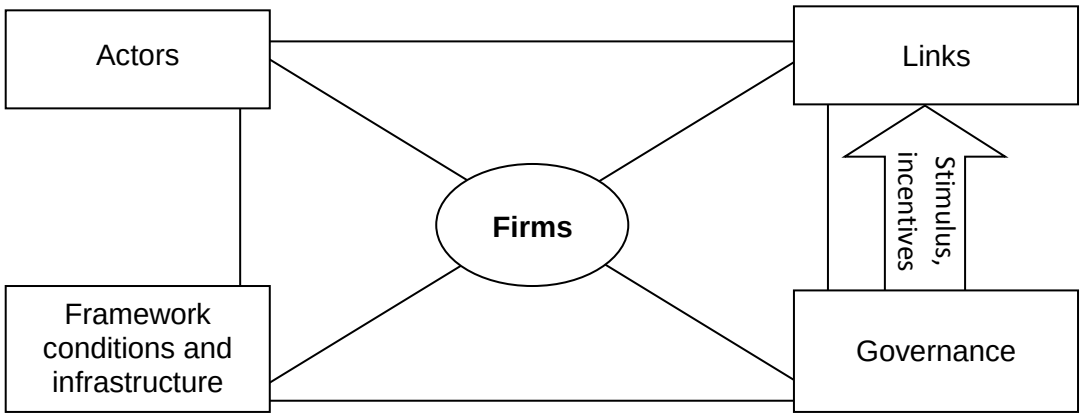
The actual effectiveness of a state’s innovation policy is presented as a star at the top of the pyramid. The more innovations a country produces, the more significant are the results measured in terms of publications, patents, raised funds and new products (Hillman et al, 2011). These results, in turn, lead to the emergence of long-term effects, such as economic growth, an efficient economy, leadership in global markets, and improved quality of life among the country’s citizens. Conceptually, the tapered form of the innovation pyramid indicates that the higher strata should function more independently of the state through market and collaborative mechanisms and brokerage activities, all of which should encourage knowledge exchange and ensure a fair return on private investments. As such, it allows for more reliance on public resources and governance efforts in the fundamental and environmental strata, which are associated with the creation of public goods (Karmyshkin, 2015).

1.3.7. Conclusions

The ultimate aim of this section within the frame of the current study was to build a conceptual understanding of national and regional innovation systems as a context for innovation and networking processes. The innovation system concepts considered in this section will serve as the basis for an analytical framework for examining the development and specific features of the Russian NIS.

As with any system, an innovation system includes elements and links. Its elements are actors and relevant institutions, which must be available and mature enough to support innovation processes. The links include flows of knowledge, information, financial resources and other resources that ensure interactions among elements while taking the complexity and versatility of innovative processes into account. An analysis of the contemporary literature provided an understanding of the key functions that a state must perform for the development of the innovation system. These functions include ensuring the availability of necessary elements and actors, creating framework conditions and infrastructure (e.g., socio-cultural, scientific, technological, political, material, financial, technical and information), and establishing governance (including policies, guidelines and best practices for actors' integration, as well as the stimulation of links in the innovation system) (see Figure 1.19).

Figure 1.19. Structural elements of an innovation system



Source: Developed by the author

However, given firms' primary interest in innovation as well as the market-based nature of contemporary economic relations in most developed countries, the functions of the state should not be responsible for the establishment of links among innovation-system participants (although can stimulate their emergence). Such links should be established through these actors' own initiative on the basis of brokerage activities, and market,

hierarchy and collaborative networking mechanisms. The literature analysis suggests that the effectiveness of national and regional innovation systems, when considered in terms of their ability to support entrepreneurial and commercialisation activities, and in terms of governance (including ensuring the performance of necessary functions and addressing challenges) largely depends on the systems' ability to move away from purely state-financed and controlled schemes toward more reliance on self-reinforcing mechanisms based on voluntary and economically justified relations among NIS actors.

To understand the role of networking in innovation, it seems fruitful to consider the case of Russia, which in its 26-year existence has ensured the presence of all essential elements of an NIS (see Chapter 2). However, as the state has historically played a significant role in Russia, not only in terms of establishing the rules of interaction among economic actors but also in terms of building and exercising control over horizontal and vertical connections, actors may not be ready to assume responsibility for initiating interactions and managing business relations, which can lead to the ineffectiveness of the entire innovation system. Therefore, it is important to analyse how companies with different levels of innovativeness initiate and govern their interactions with innovation system actors in order to attract the resources and competencies needed to do business (see Chapter 3). The results of such an analysis can be useful for deriving recommendations for the development of Russia's innovation system.

1.4. The conceptual framework

The ultimate goal of this section is to build a conceptual model for the purposes of this study. The literature review presented in Chapter 1 provided a theoretical understanding of the key concepts of the research (see Table 1.16). It also highlighted the essential characteristics of these concepts, which allows them to be evaluated in relation to this study's exploration of the role of networking in innovation among Russian entrepreneurs.

Table 1.16. Definitions of the key concepts

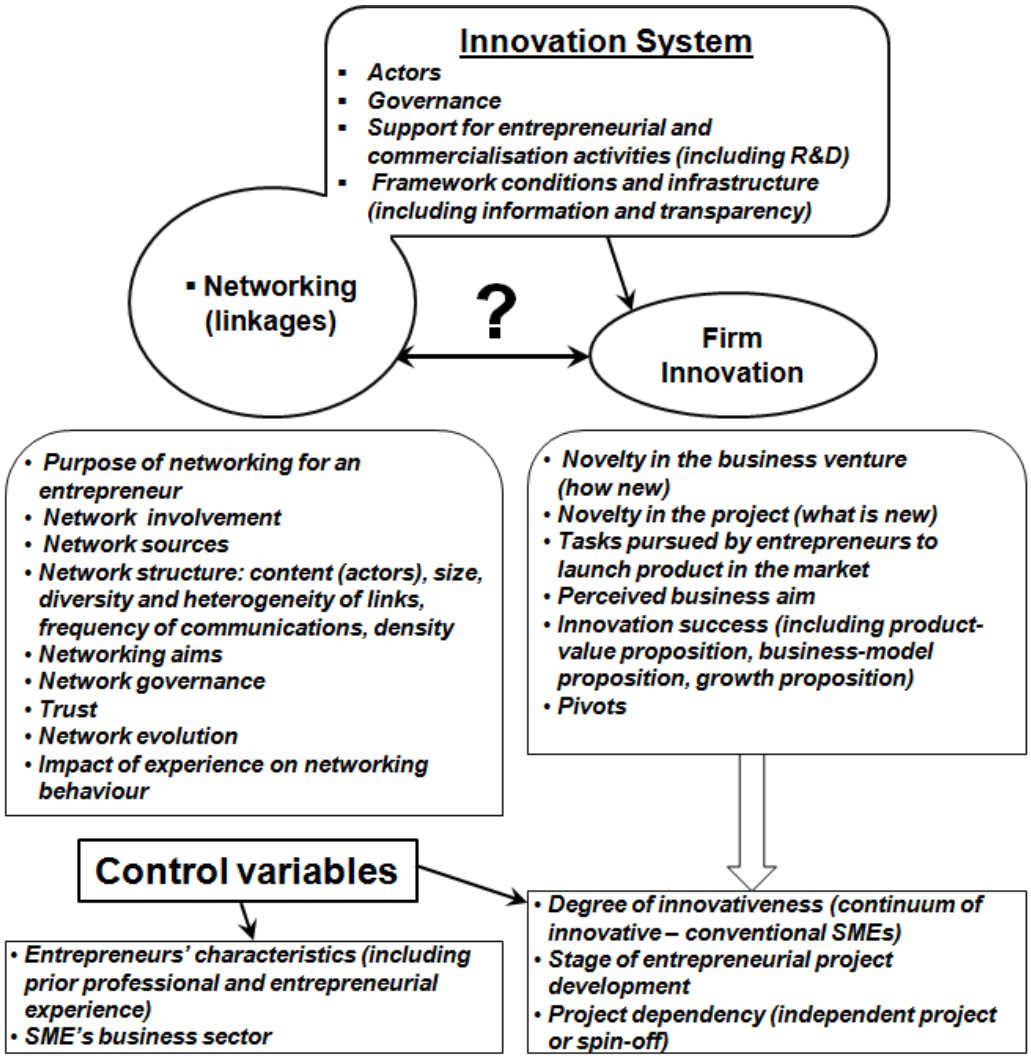
Concept	Definition
Firm innovation	The successful exploitation of ideas for the creation and introduction of a completely new or significantly improved offering or customer experience.
Networking	The establishment of voluntary associations among people or firms to integrate efforts and develop procedures to achieve a goal that has economic significance. It is seen as a widespread collaborative practice that is necessary to succeed in the new economy.
National innovation system (NIS)	A system of interconnected actors and institutions rooted inside a nation's borders that individually and jointly contribute to the initiation, production, development, diffusion and use of new knowledge and related technologies for the purpose of their commercialisation, which is understood as transformation into economically useful offerings demanded by the market.
Regional innovation system (RIS)	A subset of a national system existing in a region that has its own jurisdiction; some level of autonomy; and capacities and competences to develop policies and manage the local innovation system, which comprises interconnected knowledge-generation and diffusion subsystems (e.g., universities, training organisations, R&D institutes, technology-transfer agencies), knowledge-application and exploitation structures (e.g., clusters of firms and industries), and an innovation-supportive culture and infrastructure. These elements enable an RIS's elements and subsystems to evolve over time.

Sources: Evan and Black, 1967; Daft, 1978; Damanpour, 1996; OECD, 2005; Adams et al., 2006; Liao et al., 2008; Armbruster et al., 2008; Tavassoli and Karlsson, 2015; Turyakira and Mbidde, 2015; Hämäläinen, 2001; Freeman, 1987; Lundvall, 1992; Nelson, 1993; Metcalfe, 1995; Cooke et al., 1998; Isaksen 2002; Morgan, 2004; Tödtling and Trippl, 2005; Doloreux and Parto, 2005; Asheim, 2007; Isaksen and Nilsson, 2013

As the literature indicates, an entrepreneur's networking behaviour, especially in the context of transition economies, is insufficiently understood. Therefore, this study is exploratory in nature. It seems possible to examine the role of networking in innovation by comparing the networking behaviour of companies characterised by different degrees of innovativeness in order to distinguish certain patterns. Thus, the study aims to provide qualitative empirical evidence of a correlation between firms' innovativeness and their networking activities, rather than to quantitatively identify the existence of a causal relationship between these phenomena. Given that networking is an integral part of the innovation system in which some links occur simultaneously at the national and regional

levels (see Section 1.3), the conceptual research framework can be visually represented as shown in Figure 1.20.

Figure 1.20. The conceptual framework of the study



Source: Developed by the author

In this model, the key phenomenon is the networking behaviour of companies that conduct business within a certain RIS and NIS. The networking dimensions identified in the literature review, which are shown in the figure, were used to prepare the interview questions. In other words, they form the conceptual framework for data collection. The dimensions of innovation highlighted in the literature review are used to understand the essence of the business project being carried out by the entrepreneur and to evaluate its innovativeness. Given that both innovative and networking activities take place in the context of an NIS and an RIS, it is necessary to conduct a comprehensive study of documents, evidence and facts that will not only allow for the current state of the innovation system to be assessed but also uncover the specifics of its development trajectory. This seems important in the context of this study given the high degree of path

dependence of both the innovation systems and the networking decisions that entrepreneurs make, where the latter are guided by entrepreneurs' experiences in earlier stages of an innovation system's development. The rich picture of NIS actors (Figure 1.17), the general model of an NIS (Figure 1.14), and the system of factors and conditions affecting innovation (Figure 1.18) form a conceptual basis for analysing the current state of development of an innovation system.

Thus, to achieve the aim of this study, it is necessary to conduct complex research consisting of two parts. The first part is based on secondary data analyses related to Russia's NIS development, and understanding of Moscow's RIS features. The second part is based on the collection and analysis of primary data gathered from interviews with Moscow-based entrepreneurs covering the specifics of their networking behaviour. On the basis of a documentary study strategy, the first part provides the necessary understanding of the evolution and current state of the Russian innovation system, thereby establishing a context for interpreting entrepreneurs' networking behaviour. The second part is designed to fill the gaps identified in the literature (see Section 1.2.12). This triangulation allows for the formation of this study's main contribution with regards to the development of knowledge in the field of networking.

To implement the second part of this study, it is necessary to determine the precise subject to be discussed with entrepreneurs. Based on the explanations provided in Section 1.1.7, the discussions during the course of the interviews were to focus on any entrepreneurial project that resulted in the launch of a concrete offering in the market. That project could be implemented in either an existing SME or a newly created business enterprise. This approach was adopted to ensure the comparability of respondents' answers, which is necessary to identify common patterns of networking behaviour associated with the homogeneous phenomenon under consideration – the commercialisation of an idea, knowledge or technology. As such, networking behaviour related to the management of a portfolio of innovative projects and the view of innovation management as a driver of productivity or efficiency without the introduction of new offerings in the market are not considered.

Chapter 2. The development of the Russian NIS

This chapter aims to uncover specific features of the Russian NIS by means of a stepwise analysis of its development trajectory. This analysis is also the basis for further understanding of the current state of the Moscow RIS. The results are then used to better understand the benefits, opportunities, costs and risks that firms in Russia face in building network relationships supportive of innovation. The first part of this chapter explains the research approach chosen by the author to study the Russian NIS's development trajectory. The second part is devoted to a review of the stages of NIS development in Russia, and the identification of important implications for innovation and networking. The third part offers a brief description of the Moscow RIS as the context of firms' operations. Representatives of that RIS were interviewed in order to study their networking behaviour (Chapter 3). The results of the analysis and implications for further research are summarised in this chapter's conclusions.

2.1. Research methodology

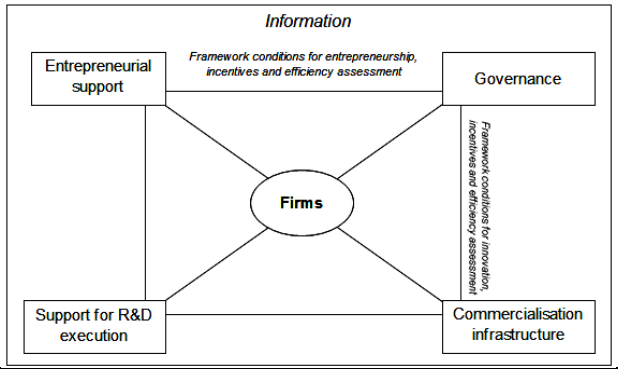
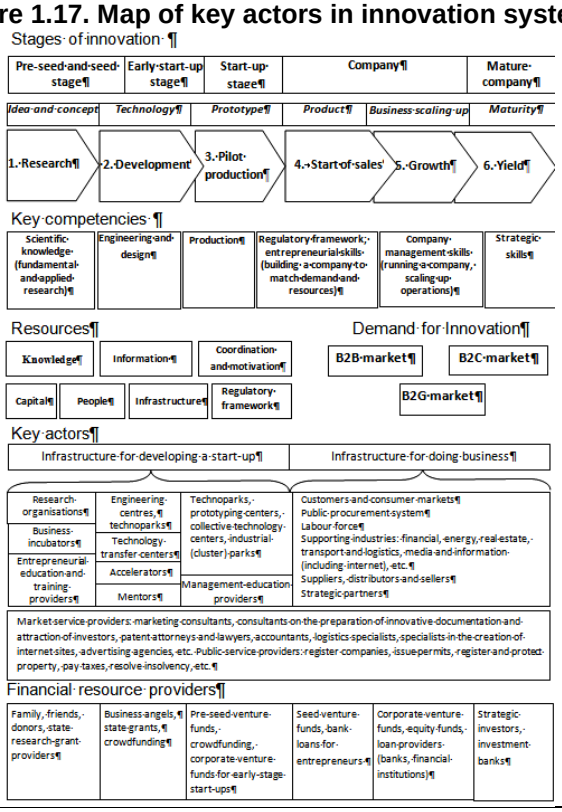
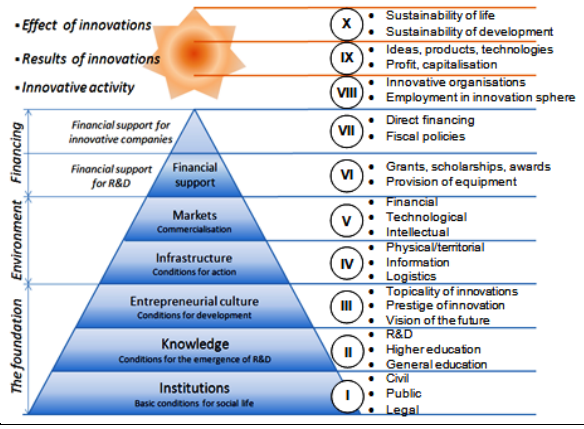
Research design

An understanding of the current state of the Russian innovation systems was formed on the basis of a documentary analysis supplemented with elements of an ethnographic study (Saunders et al., 2007), as the author witnessed the formation of the Russian NIS and the Moscow RIS. The current study can be characterised as interpretive (Saunders et al., 2007; Myers, 2009), as the author attempts, first, to make sense of the revealed facts by connecting them in a general picture that describes the phased trajectory of the Russian NIS's evolution, and, second, to derive conclusions about the benefits, opportunities, costs and risks encountered by firms in Russia in building their networks for innovation purposes. As discussed in Section 1.2.4, these dimensions can be important for firms' decisions about networking.

To understand the key features of the Russian NIS that resulted from the emergence and maturation of certain factors in each development stage, and to interpret how those factors influenced the NIS's effectiveness, the observations and analytical frameworks developed in Section 1.3 were applied, as shown in Table 2.1. In addition to the four key NIS elements (i.e., governance, support for R&D execution, entrepreneurial support, commercialisation infrastructure; see Figure 1.14), the maturity of which characterises the NIS's ability to be effective in terms of innovation, other important characteristics were included in the analysis, such as information and transparency. This was based on the reasoning that the development of the information space is vital for ensuring timely

information exchange among all NIS participants, and that it can significantly affect the transaction and coordination costs of networking.

Table 2.1. Frameworks used for the analysis and interpretation

Focal area	Framework
Key elements of the NIS	**Figure 1.14. Generalised model of a national innovation system** 
Key actors in the NIS	**Figure 1.17. Map of key actors in innovation systems** 
Framework conditions and infrastructure	**Figure 1.18. The innovation pyramid model** 

Therefore, the key question that this part of the study aimed to answer was: *How did each stage of the development of innovation systems in Russia affect the benefits, opportunities, costs and risks of creating networks supportive of innovation?*

As Moscow is the capital of Russia as well as a city through which all main information and financial flows pass, it is the city in which all key NIS institutions are located. Therefore, Moscow is simultaneously of national and regional importance. The development of Moscow's RIS depended to an extremely high degree on the evolution of the NIS. Therefore, in this chapter, the focus is on analysing the development of the NIS with a special emphasis on the institutions and activities that simultaneously influenced the development of Moscow's RIS. At the end of the chapter, the current state of development of the Moscow RIS is examined.

Data sources

The results of the analysis presented in this chapter were based on a wide range of secondary data covering the period from 1985 to 2017. The data were systematically collected through an approach based on the use of relevant search terms and phrases formulated in Russian and English. The main secondary data used in this study are presented in Table 2.2.

Table 2.2. Secondary data sources

Data type	Content	Sources of information
Regulatory documents	Federal laws, government decrees, resolutions and orders	"Garant" (www.garant.ru) and "Consultant" (www.consultant.ru) legal information e-databases
Newspapers	Publications in paper and electronic national newspapers	Vedomosti (www.vedomosti.ru), Kommersant (www.kommersant.ru), RBC (www.rbc.ru), Gazeta.ru (www.gazeta.ru) and Meduza (https://meduza.io/)
Refereed (peer-reviewed) academic journals	Research on the development of innovation and the innovation system in Russia	ScienceDirect, JSTOR, The Scientific Electronic Library (eLIBRARY.RU), Google Scholar and others
Professional analytical reports	Topic-specific analytical reports prepared by NIS development institutions and professional associations	RVC Analytics (www.rvc.ru/analytics/); RVCA Library (rvca.ru/rus/resource/library/) and others; Publications of Association of clusters and technology parks (www.akitrf.ru)
NIS actor websites	Analytical, informational and other materials posted on the official websites of the NIS actors	RVC (www.rvc.ru); IIDF (www.iidf.ru); The Foundation for Assistance for Small Innovative Enterprises in the Scientific and Technical Sphere (http://fasie.ru/); Russian Foundation for Basic Research (www.rfbr.ru/rffi/ru) and others

International indices	Results of research comparing the indicators of the development of innovation and entrepreneurship, and the corresponding business environments in different countries	Doing Business index (www.doingbusiness.org); GEM Global Reports (www.gemconsortium.org/report); Global Entrepreneurship Index (http://thegedi.org/) and others
Statistics	Statistical reports and data	Rosstat (National Statistics Bureau) (http://www.gks.ru/); High School of Economics Data Books (www.hse.ru/primarydata/)
National surveys	Results of surveys of Russian entrepreneurs and the Russian population	NAFI Research Center (www.nafi.ru)
Conference materials	Conference proceedings, personal attendance at forums, video recordings of speeches	Gaidar Forum (http://www.gaidarforum.ru/), Open Innovations Forum (openinnovations.ru)
Books, e-books and monographs	Monographs, chapters and articles covering the focal topics	Google.ru, library catalogue of Moscow State University and Kingston University
Videos	Video recordings of speeches by venture capitalists, NIS development institution experts, economists and scientists	YouTube (www.youtube.com)

Data-collection strategy

First, on the basis of literature analysis, the phases of Russian NIS development were identified (see Section 2.1.2). Second, for each phase, the analysis began with the identification of the main state policies adopted in the relevant period (see Appendix 2.1). This helped determine key search terms and highlighted the main NIS actors involved in the state's initiatives. The specifics of the implementation of the initiatives were uncovered by studying the websites of identified actors and then verified through an analysis of the information retrieved through a systematic search of the sources presented in Table 2.2. Based on the analysis of publications, texts and opinions, new topics and assumptions were identified, which were studied and cross-verified with the help of additional information gathering. Newly identified activities supportive of NIS development were added to Appendix 2.1 and interpreted in the text of the thesis. This spiral data-collection and analysis strategy was fully consistent with the approaches to the literature-review process proposed by Saunders et al. (2007) and Bryman and Bell (2007).

Moreover, the author's own observations of the NIS's evolution as well as her active involvement in Russia's innovative community from 2009 through 2017 helped her to grasp the essence of changes in the NIS's development trajectory and to assess its influence on people's attitudes. In this regard, she engaged in professional relationships and less formal communications with numerous participants in the processes described in this chapter. At the same time, this personal involvement allowed the author to understand

the differences between people's perceptions of reality and the interpretations found in official documentary sources. Additional searches for and studies of secondary data were undertaken to ensure that the final conclusions were based on documented information rather than the personal opinions of the author or people from her professional circle.

The analysis of various sources describing the formation of Russia's innovation system, including state strategy documents, technical documents and media discussions, supports the finding that innovation in Russia is interpreted almost exclusively in the context of technological entrepreneurship, the modernisation of production and the creation of new, highly technological products. Notably, this approach generally corresponds to the understanding of innovation that underlies the definition of an NIS (see Section 1.3.1). Although Rosstat (National Statistics Bureau) collects annual statistics on organisational and marketing innovations in accordance with OECD recommendations, these types of innovation were not considered in documents regulating the NIS's creation in Russia.

2.2. Phases of the Russian NIS development

The Russian NIS did not develop through a continuous process but in phases, each of which emerged when the system was affected by a certain external critical factor, or when a certain essential NIS component reached maturity and began functioning stably, thereby allowing for initiation of the next stage of development. External disturbances usually resulted in a need for adaptation, leading to institutional reforms, a change in officials and the emergence of new initiatives, which together constituted a pivot in Russia's innovation learning curve.

The formation of the Russian NIS began in late 1991 when the Soviet Union collapsed and Russia emerged as an independent country. In many ways, the trajectory of Russia's development was path dependent. The Soviet Union's legacy laid a solid foundation in some respects, while in others it created serious barriers. As described in Table 2.3, six phases of development of the Russian NIS can be identified based on a review of the literature, including scientific and analytical research (e.g., OECD, 2011; Golichenko, 2011, Golubtsov et al., 2013), media publications[3], government documents[4], and web sites representing activities of innovative projects and institutions.

[3] Publications for the period 1990-2017 found in newspapers and on the news sites Vedomosti, Kommersant, RBC, Gazeta.ru and Medusa, among others.
[4] Federal laws, government decrees, resolutions and orders for the period 1985-2017 found in the "Garant" and "Consultant" electronic databases.

Table 2.3. Phases of the Russian NIS development

	Key external factors	Essence of the period
Phase 0: Soviet background (until 1991)	Need for industrialisation, Cold War arms race, transition to the commodity economy in the 1970s, period of reforms from 1985 to 1991 (*perestroika*).	Accumulation of scientific and technical potential from 1950 to 1970, gradual economic degradation from 1970 to 1985 resulting in economic stagnation, beginning of a lag in economic and scientific development.
Phase 1: December 1991 – December 1999	Military coup in August 1991, dissolution of the Soviet Union in December 1991, first (1992-1994) and second (1994-1998) stages of privatization, Russian financial crisis in August 1998 (devaluation of the RUB, Russian government defaults on domestic and external debt).	Turbulent restructuring, early experimentation with new innovation policies (OECD, 2011), destruction of R&D system and networks created in the Soviet period, decline in the prestige associated with scientific careers, spontaneous entrepreneurship, initiation of reform aimed at integrating higher education and fundamental science, emergence of managerial education.
Phase 2: 2000 – 2005	First term of Vladimir Putin's presidency.	Economic stabilisation, formation of a methodological understanding among government officials of approaches to building an NIS (including through the assistance of the international community), significant additions to the innovation policy framework, continuation of education-system reform to achieve convergence with international principles.
Phase 3: 2006 – 2008	Second term of Putin's presidency. Start of the Global economic crisis of 2008-2009.	Expansion of innovation-policy framework, consolidation of resources, beginning building infrastructure to provide innovation actors with access to resources (supply side), support for the development of technologies in priority areas, emergence of a community of innovation-related professionals.
Phase 4: 2009 – 2013	Global economic crisis of 2008-2009, first term of Dmitry Medvedev's presidency, start of the third term of Putin's presidency.	General finalisation of the physical setup of the innovation infrastructure, efforts to establish internal links within NIS to allow the resource base to be used as efficiently as possible (e.g., support for intensification of R&D, opening of innovative forums and virtual platforms in the hope that spontaneous networking would lead to increased innovativeness), enforcing of innovation in state corporations, promotion of innovation in the press, heroisation of innovators and involvement of the general public in the broad discussion in an attempt to make innovation a new national idea, broad empowerment of people to innovate, stimulation of growth in the number of innovative start-ups, mass emergence of educational programmes in the field of entrepreneurship, increase in the number of incubators and accelerators, broad implementation of initiatives to increase government performance transparency.

Phase 5: 2014 – 2018	Accession of the Crimea following a referendum, introduction of international sanctions that restrict the inflow of foreign capital and technology, war in Syria, the deterioration of relations with the USA and the introduction of sanctions that limit the ability to implement international projects.	Efforts to achieve increase in NIS efficiency; stimulation of internal demand for innovation through government procurement of goods of Russian origin, and goods and services produced by small and medium-sized enterprises; intensification of corporate innovation programmes; stirring up import-substitution programmes; restructuring of resources within the innovation system; change in approaches in terms of providing more focused support to stimulate emergence of innovation in strategically important markets in the framework of National Technological Initiative; development of innovative territorial clusters; wide launch of Internet-based information projects in support of the development of the innovation system; mass implementation of projects related to the transparency of the activities of federal and regional executive bodies; implementation of the project-management approach in the field of innovation development.

Source: Developed by the author

An understanding of the set of conditions that were the starting point for building Russia's innovation system as well as the trajectory of its development is extremely important in the context of this study. In this regard, it is the key to note that networking is a type of social behaviour in which actors' decision making relies heavily on their adolescent experiences with building relationships that largely depend on what was perceived possible in the existing context. Notably, during the Soviet period and for at least the first decade after the Soviet Union's dissolution, the ideologically dependent education system did not support individuals in developing reflection skills, or the corresponding ability to assess a situation and make independent decisions. As such, the Russian NIS has been built over a relatively short period of 25 years, which means that people who are now 38 years of age or older bear the marks of *perestroika*, privatization and post-*perestroika* restoration in their decision making and behaviour. Their networks generally include a lower number of agents because no environment existed to build up interactions when they were young. In contrast, the younger generations are often characterised by very different patterns of networking behaviour resulting from their experiences during Russia's turbulent search for a pathway for innovative development. Thus, their networking behaviour might reflect the characteristics and priorities of the corresponding stages of NIS evolution.

2.3. Analysis of the evolution of the Russian NIS

Given the high degree of path dependency in the Russian NIS's development, to build a holistic understanding of its evolution it necessary first study the institutional-structural pre-conditions that were part of the Soviet Union's legacy.

Phase 0: Soviet background (until 1991)

Historically, the governance of Russia's scientific and technological development has been highly centralised. Until 1991, the State Committee of the Soviet Union on Science and Technology (SCST) coordinated the activities of the scientific and technical sector. The SCST was responsible for determining the main directions for science and technology development, planning and supervising R&D in spheres deemed to be of national strategic importance, and coordinating the commercial implementation of the outcomes of fundamental and applied science. The SCST also drew up plans for financing R&D and developing its material base. The SCST had scientific councils on the most important and complex scientific and technical problems, and it coordinated the entirety of relevant R&D (Dobrov, 1970).

The system of R&D organisations (e.g., research institutes, design bureaus, engineering organisations, experimental and prototype centres) was mainly based on the sectoral principle. The relevant Sectoral Ministries collected applications from subordinate production units and enterprises, and developed R&D plans each year for the following year. The Sectoral Ministries also approved staffing and wages for R&D organisations, and thereby ensured that they met identified needs and worked within the allocated state budget. The R&D organisations had the right to independently enter into economic contracts with enterprises interested in the implementation of R&D. However, the extra funds available for such activities were, as a rule, insignificant (Demidov, 2009). The commercialisation of the R&D organisations' innovations was handled by industrial enterprises under the jurisdiction of the relevant ministries.

Moreover, the Academy of Sciences was responsible for conducting research in key areas of natural and social sciences. Its resources were mainly concentrated on the implementation of fundamental research. Given its unique competencies and strategic vision, the Academy of Sciences participated in the analysis of a wide range of scientific and technical problems relevant to the national economy, and it played an important role in the planning and forecasting of scientific and technological development (Dobrov, 1970). Over the years, the Academy of Sciences created a wide-ranging network of research

institutes and research sites, as well as its own social infrastructure. As of 1988, the Academy comprised 332 scientific institutions (e.g., research institutes and laboratories, their branches and departments, observatories, research stations, a research fleet, libraries, museums) and about 170 non-scientific organisations, such as engineering, design, experimental and prototype centres; hospitals; expeditions; health-care institutions; building and construction organisations; kindergartens; holiday centres; and other infrastructure-related organisations. 90% of the Academy's activities were financed through the state budget (Petrovsky et al., 1990).

Notably, the integration of research and educational activities within the Academy of Sciences occurred only at postgraduate education level. The same was true for parallel academic structures, such as the Academy of Medical Sciences, the Academies of Agricultural Sciences and the Academy of Pedagogical Sciences (Johnson, 2008). It was within this framework that the degrees of candidate and doctor of sciences were prepared and defended. In other words, from an organisational point of view, in-depth fundamental research was separated from higher education, and the results of the former were rarely integrated into higher education or teacher training (Johnson, 2008). During the Soviet period, the number of scientific personnel working at the Academy of Sciences increased steadily (see Table 2.4), and more than half of those employees held candidate or doctor of science degrees. In 1989, for example, doctors of science accounted for 11.6% of the Academy's 64,487 researchers and another 46.6% held candidates of science degrees.

Table 2.4. Change in the number of researchers in the Academy of Sciences' scientific institutions (at the end of the year, people)

	1950	1960	1970	1975	1980	1985	1989
Total	7,142	22,849	35,363	42,500	48,934	57,481	64,487
Doctor of Science	1,017	1,896	3,125	3,935	4,891	6,195	7,458
Candidate of Science	2,754	7,618	14,068	18,737	22,320	26,565	30,038
Scientific personnel without a degree	3,371	13,335	18,170	19,828	21,723	24,721	26,991

Source: Petrovsky et al., 1990

By 1991, Russia's higher-education system included three main types of universities (see Table 2.5). This was a direct result of the country's development path, which was driven by the need to provide the economy with the necessary personnel (Kuzminov et al., 2013).

Table 2.5. Types of higher-education institutions in the Soviet Union

Type	Functions and forms
Branch-based higher-education institutions	Functions consisted of training personnel for a particular sector of the economy on a national scale. There were several forms: – Specialised higher-education institutions working for a specific labour market (industrial sector). These institutions were often geographically close to the corresponding production (e.g., the institutes for transport

	engineering or aviation were located in regions close to the relevant manufacturing complex). – Higher technical-educational institutions were usually established on the basis of large industrial enterprises, and handled the training of engineers from among the employees of those enterprises. – The leading branch-based higher-education institutions also provided scientific support to the various industries, as well as methodological and training support for other branch-based higher-education institutions.
Higher-education institutions based on the territorial-production principle	Functions consisted of training the personnel needed for specific sectors of local labour markets. Each region or group of regions had pedagogical, medical, polytechnic and other higher-educational institutions that matched the local economic structure. Some institutions were subordinated to sectoral ministries. Methodological and personnel support were provided by the leading institutions of the corresponding type, which were located in regional capitals. This system ensured the relatively homogeneous training of personnel for various sectors of the national economy across regions.
Classical universities	Functions consisted of training personnel for science and other higher-education institutions, primarily in fundamental disciplines. These institutions also trained personnel for the management system (typically, graduates of economic, history and legal departments were viewed as qualified for administrative positions). In some regions, these functions were carried out by pedagogical institutes, while in other regions teachers were trained in the classical universities.

Source: Developed by the author

The system of higher professional education was under the jurisdiction of the USSR's Ministry of Higher and Secondary Special Education. One of this ministry's tasks was to plan the number of students, specialties and programmes for each higher-education institution in accordance with the expected needs of the national economy (Kuzminov et al., 2013). Up until the collapse of the Soviet Union, graduates were sent to work in organisations and enterprises from which applications had been received.

A significant proportion of higher-education institutions were concentrated in the country's capital and major cities, and graduates generally possessed a narrow industry specialisation. In other words, the institutions developed specialists with certain profiles (Johnson, 2008). The 1980s brought an increasing trend in the number of universities and polytechnic institutes (Katrovsky and Guba, 2015), which provided wider training. In 1990, Russia had 514 higher-education institutions (RIPC, 1991) (see Table 2.6), which included more than 60 research institutes and design bureaus, and about 1,300 research laboratories and sectors.

Table 2.6. Change in the number of higher-education institutions

1914	1917	1940	1950	1960	1970	1980	1990	2000	2005	2010	2011	2012	2013	2014	2015
72	150	481	516	430	457	494	514	965	1068	1115	1080	1046	969	950	896

Source: Katrovsky and Guba, 2015; Rosstat, 2016

In general, the system of higher education that existed in the Soviet Union was aimed at providing training and education. As such, it was only partially involved in scientific and applied research. R&D, design and engineering projects were more common among technical education institutions. The technical institutes had laboratories, design and engineering offices, and experimental and prototype centres, and they carried out research and engineering for the key industries, which in turn determined the country's competitiveness (Kuzminov et al., 2013). Nearly the entire system of personnel training and the research agenda of higher-educational institutions with engineering and technical profiles were to the great extent connected with the country's military-industrial complex. These higher-education institutions, along with branch-based research institutes and design bureaus, competed for R&D orders from the military and were often "closed organisations" working under tight security in isolation from external contacts (Johnson, 2008, p. 163).

The “civil specialty” universities were less involved in the R&D carried out in the various sectors, which created a gap between what was studied in the institutions and what the graduates faced when they came to the workplace. The ideological content of education in the social sciences was completely controlled by the state and its development was determined by the political tasks of the ruling communist party (Kuzminov et al., 2013), rather than by the need to correctly reflect the actual processes taking place in society and in the economy. Moreover, the predominantly lecture-based teaching format did not help students develop the analytical skills necessary to independently reflect on reality (Johnson, 2008, p. 163).

It should be noted that higher education, in general, was not aimed at training people with initiative or those with leadership qualities. In Russia, which had a long history of state dominance in the economy (even before the era of socialism), the level of trust in entrepreneurship and private initiative was low (Meduza, 2015). Moreover, relevant competences were not formed by the education system. Such disciplines as "business administration", "management" and "entrepreneurship" were not included in educational curricula, and there were no academic degrees in management. In addition, these subjects had no corresponding departments or faculties in higher-education institutions. Instead, a range of disciplines in economics and national economy administration was taught, and students were mainly trained to solve issues related to economic-activity planning and financial controlling. Scientific theses and dissertations on the management of organisations led to "candidate of economics" and "doctor of economics" degrees. At the

same time, the personal qualities necessary for making managerial decisions and taking on leadership roles were formed in military universities (Val'kov, 2012).

Scientific activity on the university level was financed through the state budget and through business contracts with enterprises. The main activity for any higher-education institution faculty member was teaching. Faculty members did not face demands to conduct research activities and publish research like those faced by employees of the Academy of Sciences (Johnson, 2008). By the beginning of 1990, 219,700 faculty members worked in the higher-education institutions of the Russian Soviet Federative Socialist Republic, of which 6.2% were doctors of science and 52% were candidates of science (see Table 2.7).

Table 2.7. Number of faculty members in higher-education institutions (mid-year, thousands of people)

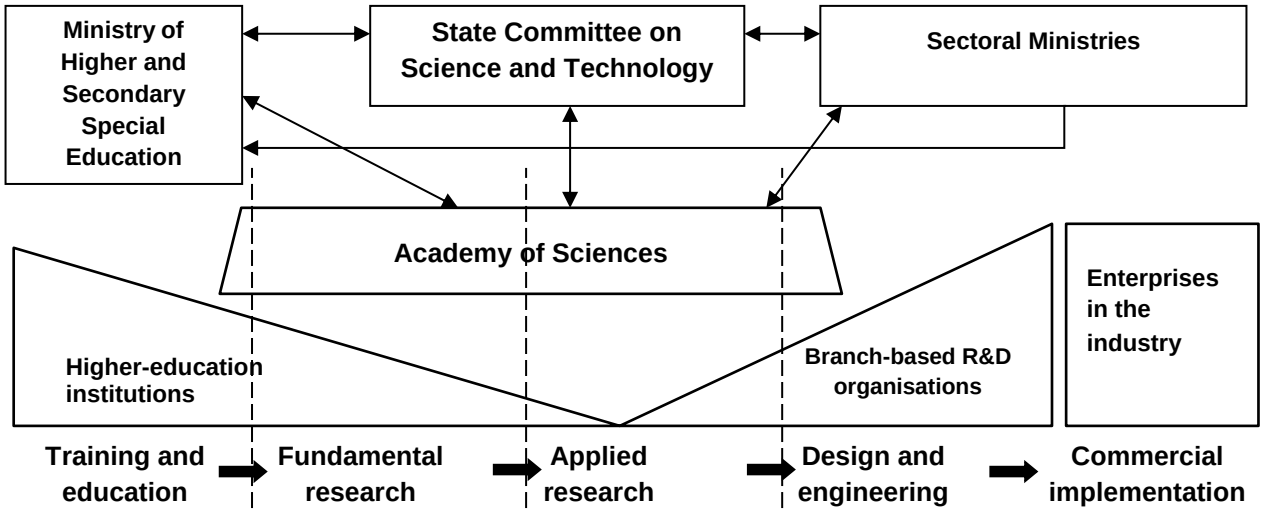
Qualification	1975	1980	1985	1990	1995	2000	2010	2015
Total	180.7	204.0	205.1	219.7	240.2	265.2	324.8	244.8
Doctor of Science	8.2	9.6	9.8	13.7	20.1	28.0	40.2	38.4
Candidate of Science	76.1	92.4	103.6	115.2	117.5	125.4	169.2	145.5

Source: Rosstat, 2016

Therefore, the Soviet system of higher education was, in fact, a subsystem of the planned economy. The only real factors affecting changes within the system were the plan for the development of the national economy and the ruling party's ideological tenets. The universities did not participate in assessing the plan's feasibility. As such, they neither participated in their own development nor served as agents of economic and societal development (Kuzminov, 2013).

The above discussion allows to conclude that the Soviet Union before *perestroika* had a system in which institutions with different affiliations were responsible for the implementation of clearly limited tasks in the commercialisation chain (Vladimirov, 2013), as shown in Figure 2.1. Links within the chain were not strong and relationships were based on contractor-customer interactions, with each party being only familiar with its own narrow task. The integration of processes and the distribution of funding were handled by the governing bodies.

Figure 2.1. NIS in the Soviet Union



Source: Developed by the author

In the Soviet system, the state acted as the main customer of R&D and as the main source of funds (Kara-Murza, 2013). It also coordinated the interaction of various parts of the system from the collection of needs through the distribution of tasks to the monitoring of results. Given the narrow profile of personnel training, and the focus on specific tasks for each element of the system, the majority of participants in the scientific and technological sector had a limited range of competencies that were directly related to their particular research subjects. Their work never involved attracting financing or introducing products onto the market. When the Soviet Union collapsed, this narrow understanding of commercialisation processes and skills meant that people were unable to quickly adapt to the abrupt changes that occurred when the entire chain of existing relationships, finances, information and guidance disappeared.

The economic, political and social problems of the pre-*perestroika* period (1970s-1980s) led to a significant reduction in the Soviet Union's scientific potential, as did the poor integration of the scientific and engineering community into global processes of science development, and the high degree of politicised decision-making regarding research directions. As a consequence, in the 1980s, the Soviet Union began to lag behind most developed countries in terms of scientific and technological development (Allahverdyan, 2014) in a number of strategic areas, including computer technology, biotechnology and the production of new materials (Kalinov, 2011).

The documents determining the state scientific and technical policy of the *perestroika* period (1985-1991) indicate that science was to be the leading factor in the economic and

social development of Soviet society. In fact, this was declared as the main goal. The task was to form an integrated system that embraced all areas of science, invention, standardization, design and engineering. The aim was to change the approach to production-plan creation in a way that took the plans for scientific and technological development into consideration (Allahverdyan, 2014), which seemed quite progressive at the time.

The initiatives of the *perestroika* period included the creation of interdisciplinary scientific and technical complexes (ISTC), which were composed of training centres, design and engineering organisations, and commercial firms operating on a self-financing basis through commercial contracts. 23 ISTCs created in the mid-1980s allowed for acceleration of the implementation phase and the shortening of the "science – technology – production – consumption" cycle. Consequently, the number of scientific and technical developments moved into production increased by almost 500% between 1986 and 1988 (from 16 in 1986 to 78 in 1988; Kalinov, 2011).

Due to the technological backlog, the main emphasis during the *perestroika* period was not on the development of fundamental science but on the technical modernisation of production. In fact, the depreciation of fixed assets in all key industries had reached a critical level of 40% by 1985 (Rogozina, 2007). Special attention was paid to the development of the scientific and technical system on the regional level, especially in Siberia and the Soviet Far East, primarily owing to the need to explore new oil and gas reserves and to intensify oilfield use through new technologies aimed at improving yields (Kalinov, 2011). Many scientific developments during that period were associated with the military-industrial complex. In 1985 and 1986, state expenditures for the civilian science sector amounted to only 32% of total state expenditures on scientific and technical areas (Kalinov, 2011).

Implications for innovation and networking

By the time of its emergence, Russia had a number of strengths and weaknesses, which are presented in Table 2.8. They reflect five key points: entrepreneurial support, support for R&D execution, commercialisation infrastructure, governance and information availability. As such, they form an understanding of the factors that determined the development of innovation systems in Russia.

Table 2.8. Analysis of the Soviet Union's legacy

Strengths	Weaknesses
• Accumulated intellectual capital, well-developed scientific schools and scientific community • Inventive skills • Long-standing scientific and engineering culture • International reputation of excellence in some science and technology fields, such as aerospace and nuclear science • Availability of R&D organisations and qualified staff • System of social guarantees, including health care and education • Government commitment to reform • Openness of people to change with the goal of ensuring a new, stronger Russia	• Absence of ownership of the means of production • Absence of a legal system to ensure protection of rights • Absence of relevant regulations • Absence of an entrepreneurial culture and skills for conducting independent business activities • Long-standing psychological dependence on guidance and control from "higher authorities" and "people in power" • Absence of business infrastructure • Absence of mechanisms to stimulate entrepreneurial and innovative activities • Absence of qualified personnel for the organisation, management and conduct of innovation activities • An education system unable to train people to function in a market economy • Dependence of educational institutions on public funding • Disintegrated R&D system • Dependence of R&D institutions on the sectoral economic system • Lack of experience with civil commercialisation of technological research developed for the military-industrial complex • Lack of an innovative infrastructure that could function in market conditions • Lack of horizontal links and mechanisms that could ensure effective commercialisation • Main customer for technological and innovative products was the state • Underdeveloped financial market • Absence of mechanisms to provide private financing of innovation • An inherited governance system unable to perform in market conditions • Lack of understanding of methods of innovation development • Scientific and technological backwardness and obsolescence of fixed assets • Decline in living standards and social tensions in society as a result of economic stagnation and *perestroika* • Opaque information system and an almost complete information vacuum • High transaction costs and bureaucratic hurdles faced when attempting to address any administrative question • Entrenched system of nepotism, bribery and corruption

Source: Developed by the author

The main advantage was the availability of scientific potential. However, as this potential existed in isolation from the needs of the actual industry, it could not effectively contribute to solving the tasks of technological improvement and the diversification of products or services. The economic and political system resulted in a high degree of centralisation in decision making, including in interactions among scientific research institutions, engineering organisations and state-owned corporations. The centralised planned economy did not assume that economic actors would take the initiative. In essence, official relations were established on the basis of prescribed procedures of interaction in which the dominant links were inter-regional and organised within individual sectors. Regions had no real

power to interfere with the development of the state-run industrial enterprises (Radosevic, 2000) that dominated the economy. Moreover, people possessed narrow, specialised professional competencies, worked as assigned in organisations that already had places in the value chain and were not expected to take responsibility for creating ties. In these conditions, which were characterised by a state-run system for distributing the material goods necessary for personal and business consumption, social networking practices like *blat* and *svyazi* became the basis of informal business relations (Michailova and Worm, 2003) (see also discussion in Section 1.2.11).

The events of the second half of 1991 rapidly led to the collapse of the Soviet Union. The newly formed government committed itself to extricate the country out of political and economic crisis, having for this extremely limited time.

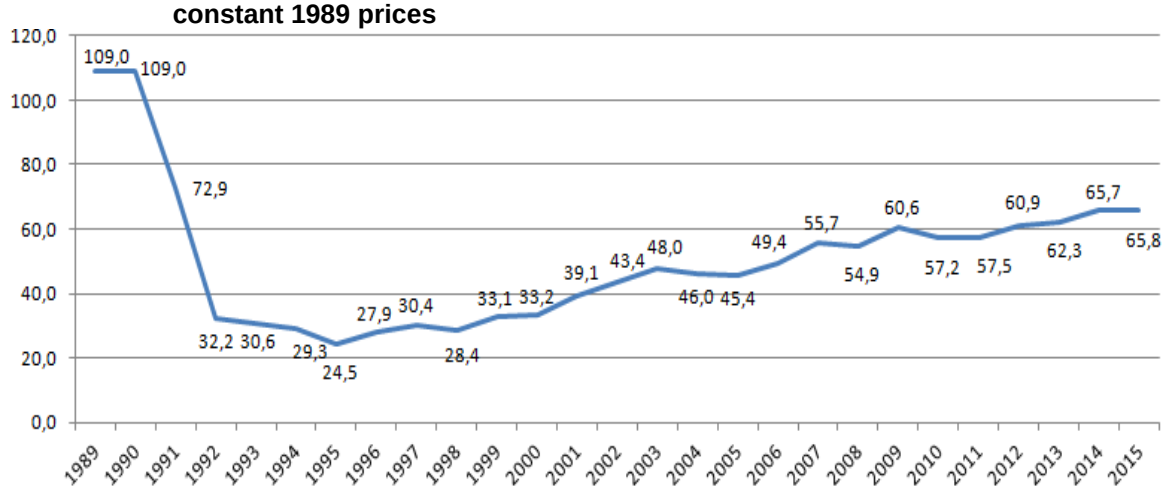
Phase 1: December 1991 – December 1999

The liquidation of the Soviet Union in December 1991 led to the destruction of the country's network of scientific and research institutions. Consequently, the republics, including Russia, were left with structurally incomplete scientific communities. The shift in political conditions led to the dissociation of scientists and the rupture of meaningful horizontal links within the communities, followed by the reorganisation of interactions or even the abolition of a number of research projects (Kara-Murza et al., 2014).

Vertical integrity was also destroyed due to the liquidation of the ministries, which resulted in the near elimination of branch-based science, which accounted for 70% of the entire system (Kara-Murza, 2013). Branch-based research institutes, design bureaus and engineering organisations found themselves in a vacuum, as the institutional entity that provided an inflow of orders and funds had disappeared (Kara-Murza, 2013). The destruction of the sectoral system also affected the activities of the Academy of Sciences and higher-education institutions, as the sectoral ministries financed a certain part of fundamental and applied research conducted by the divisions of the Academy of Sciences and higher-education institutions (Kuzminov et al., 2013).

Economic and financial difficulties led to a sharp decrease in the allocation of funds for Russian civil science between 1990 and 1995 (see Figure 2.2). This included a reduction in funds for the renewal of instruments and equipment (from 11-12% of GDP allocated to science in the mid-1980s to 2.7% in 1996; Kara-Murza et al., 2014).

Figure 2.2. State expenditures on R&D in the Russian Federation, RUB billions, in constant 1989 prices



Source: Rosstat, 2016

The Presidium of the Russian Academy of Sciences (RAS) was compelled to adopt a resolution obliging all departments to make decisions regarding the reorganisation of each scientific institution before November 1, 1992. They were also asked to reduce the list of areas of study through identification of scientific schools with the highest scientific potential and retaining the relevant sub-divisions and liquidation of other structural units (Kara-Murza et al., 2014).

The destruction of the scientific research system that began with *perestroika* (1985-1991) only worsened during the period of privatisation (the most active period was in 1992-1996). As a result of the change in ownership structure and the corresponding change in the decision-making system, as well as the liquidation of enterprises in various industries that occurred as a result of privatisation, the R&D ties that existed under the Soviet system were almost completely destroyed (Berman, Filippov, 2010).

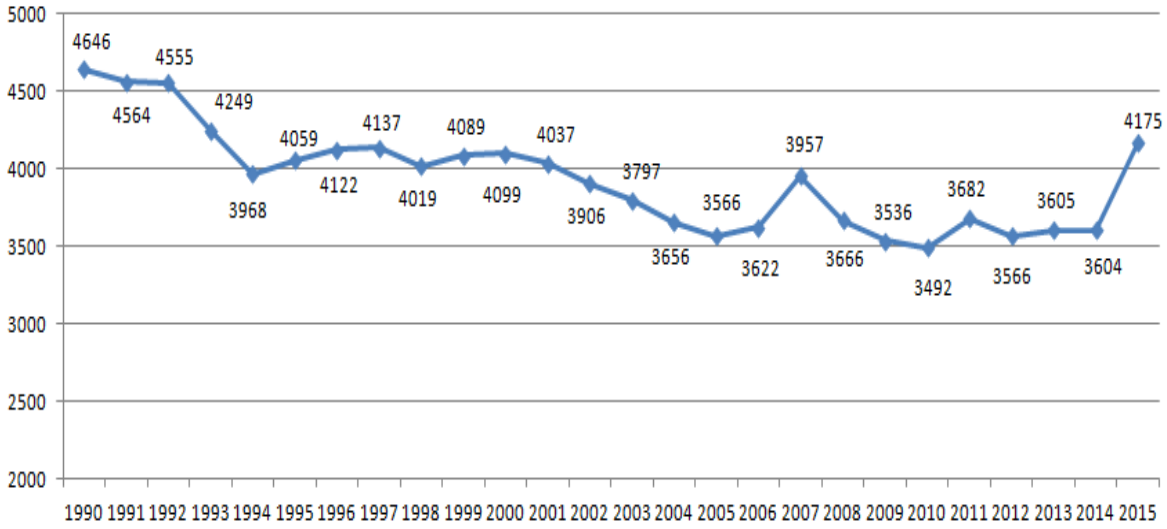
Throughout the process of decentralisation and deregulation, most of the enterprises that had previously existed in the framework of the planned economy found that their primary task was to survive (Johnson, 2008). However, they had neither the experience needed to conduct economic activity under the new conditions nor a sufficient number of qualified personnel to take on this task. Consequently, corporate funds allocated to scientific research were sharply reduced (Vladimirov, 2013), leaving the Russian R&D sector to survive in an environment characterised by a nearly completed lack of customers and financing. Branch-based science was preserved only in the state sector, mainly in the defence, aerospace and nuclear industries (Vladimirov, 2013).

However, in light of new laws on privatisation that were adopted in 1991, some design bureaus, engineering organisations and experimental laboratories that had nearly ready-to-

use technologies as well production equipment were able to break away from state institutions. They created separate organisations that could successfully cope with the task of independently developing and creating the technological products that were in demand in the emerging market economy[5]. Nevertheless, the destruction of the scientific and technological system could not continue. Therefore, in 1992, several state orders were issued forbidding the separation of R&D units from the state research, design and engineering organisations, higher-education institutions, and other scientific institutions.[6]

The significant changes in external factors had a lasting impact on the scientific system. From 1991 through 1998, organisations conducting R&D work experienced mass closures or reorganisations. Moreover, their number steadily declined. In fact, as of 2015, this number had not yet returned to the *perestroika* level (see Figure 2.3).

Figure 2.3. Total number of R&D organisations in Russia



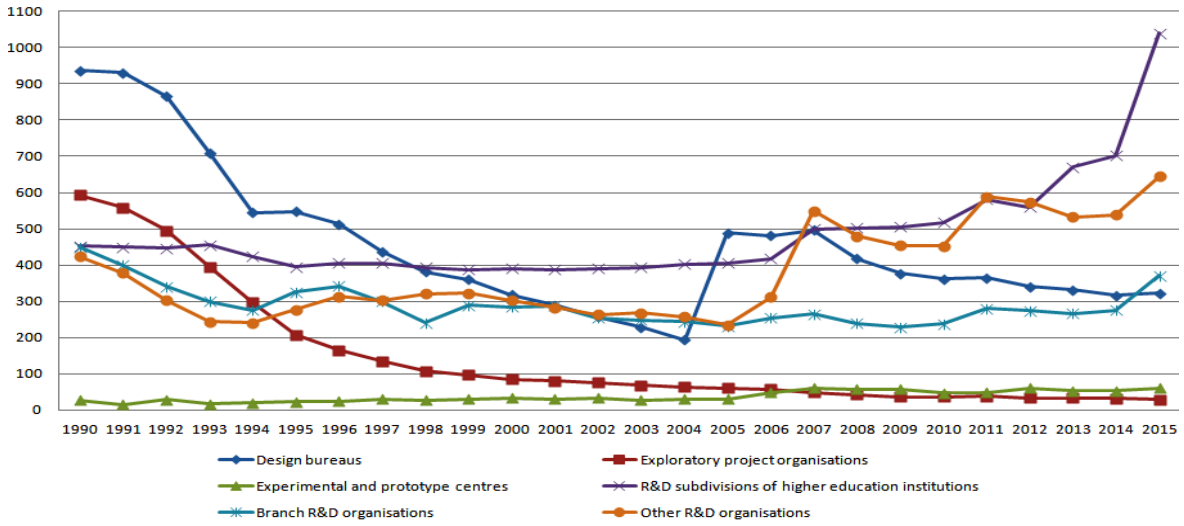
Source: Rosstat, 2016

The number of design and engineering institutions was also drastically reduced (Vladimirov, 2013; see Figure 2.4). Without these institutions, it was impossible to build new capacities or to introduce fundamentally new technologies.

[5] It can be noted that 14 of the 100 most successful innovation companies in the TechSuccess-2016 national contest were formed in 1991. These companies operate in such sectors as electronics and instrument making, industrial equipment, medical equipment, materials, and information technology. For more details see the official website: http://www.ratingtechup.ru/rate/?BY=INNOVATION.

[6] Presidential Decree N426 of 27.04.1992 On Urgent Measures to Preserve the Scientific and Technical Potential of the Russian Federation

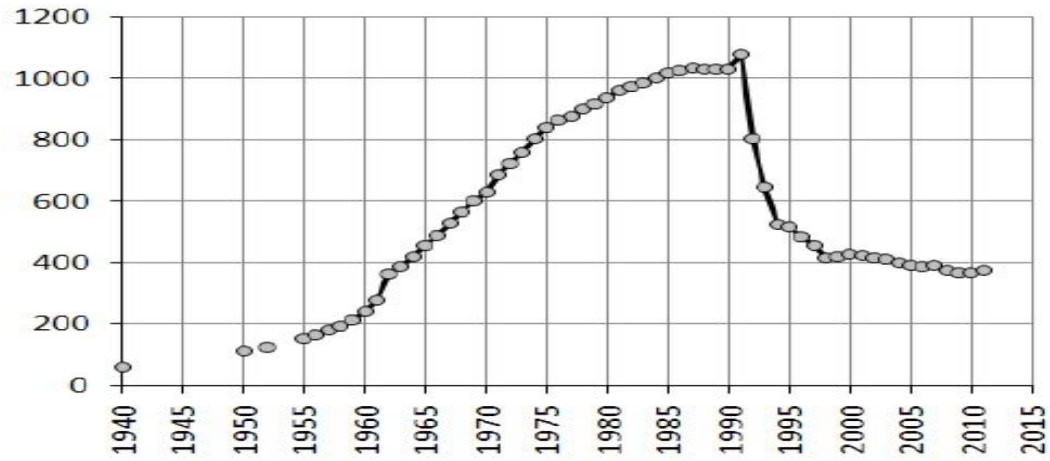
Figure 2.4. R&D organisations in Russia



Source: Rosstat, 2016

The drastic reduction in R&D funding, the restructuring of R&D activities and the inability of research structures to adapt to the new self-financed conditions led to a massive layoff of scientists. Those dismissed could not find work. According to the Moscow Labour Exchange (Kara-Murza et al., 2013), the need for scientists in 1992 was only 1.3% of the total number of laid-off scientific workers. In other words, there were almost 100 applicants for each open position. Between 1991 and 1999, the number of scientists in the Russian Federation decreased by more than 250% (see Figure 2.5).

Figure 2.5. Number of scientific workers in Russia, thousands

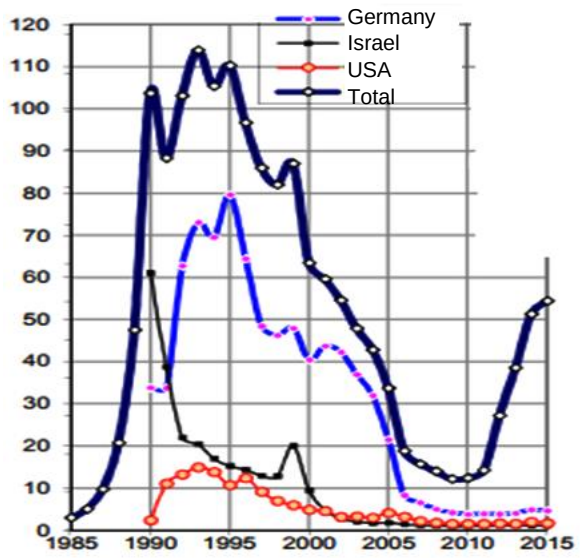


Source: Kara-Murza et al., 2013

Moreover, from 1991 to 1998, the salary of a researcher was lower than the average salary for the economy as a whole (Kara-Murza, 2013). This led to a decline in the prestige of scientific work and reluctance among young people to pursue a scientific career. As they were basically without means to survive, highly qualified personnel were forced to either

seek employment in other industries or emigrate. Emigration peaked near the end of *perestroika* and in the post-*perestroika* period (see Figure 2.6).

Figure 2.6. Emigration of Russians to foreign countries, thousands



Source: Kalabekov, 2017

Estimates indicate that between 100,000 and 250,000 scientists left Russia between 1991 and 1998 due to a lack of "money and prospects" (Kireev, 2010). According to an analysis undertaken by the Russian Union of Engineers[7], the destruction of R&D organisations in the post-*perestroika* years had a particularly severe effect on the engineering community. People moving abroad took their knowledge of technologies and research experience with them, which led to an R&D staff shortage not only in terms of the need for highly skilled employees but also in terms of the need for faculty members who could provide proper education and training.

Therefore, by 1994, the situation in Russia had deteriorated in terms of the loss of research personnel (mainly in the fields of engineering and development), the disappearance of scientific and technical ties within the country, and the destruction of an already inadequate and unbalanced system of scientific and engineering training. Russia had to rebuild its NIS from the ground up, and this development was significantly influenced by the opportunity to engage in international cooperation that emerged at the end of *perestroika*. This led to numerous attempts to implement international experiences on Russian soil.

Governance

The main task of the government from 1991 through 1994 was to carry out economic reforms aimed at privatisation and decentralisation. The major challenge was to create an

[7] www.российский-союз-инженеров.рф.

institution for private ownership of the means of production. At the same time, certain measures were taken to help preserve Russia's scientific and technological potential. This period is associated with the beginning of the formation of a legal framework, the introduction of mechanisms for allocating financial support to priority areas in science and technology, and the provision of support to key actors in the commercialisation chain.

In 1995-1999, the main efforts were devoted to the transformation and integration of the detached parts of the scientific and technical system that were likely to become the basis of the future innovation system, as well as the development of methodological approaches to the formation of NIS. The key strategic policy introduced in 1995 was the government programme "Reforms and development of the Russian economy in 1995-1997". The document included a section entitled "Innovative and scientific and technical policy", which indicated priority areas for development, such as building a legal framework for regulating innovative, scientific and technical activities; implementing structural reforms in the science and technology sphere; and attracting investments in the areas of research, development, design and engineering. The main governance initiatives introduced in the focal period to form the foundations of the Russian NIS are summarised in Table 2.9 and Appendix 2.1.

Table 2.9. Formation of the foundations of the Russian NIS in the first phase, 1991-1999

Aspect of NIS foundation building	Key initiatives
Creation of private ownership system	Privatisation of state and municipal enterprises.
Formation of a legal system	Adoption of laws on copyright and related rights, on patent, on education, on higher and postgraduate professional education, on science and state science and technology policy, on the status of the science city of the Russian Federation.
Creation of first mechanisms to stimulate entrepreneurial activities	Adoption of law on state support of small business and development first.
Structural reforms in the scientific and technological sphere	Adoption of doctrine of the development of Russian science and the law on science and state science and technology policy, the first concept for the innovation policy of the Russian Federation for 1998-2000.
Creation of first NIS development institutions	Creation of the Russian Foundation for Basic Research (RFBR), The Foundation for Assistance for Small Innovative Enterprises in the Scientific and Technical Sphere (the Bortnik Foundation), The State Institution "Centre for Technological Development".

Source: Developed by the author

Support for R&D execution

In the beginning of the focal period, support for the development of the science and technology sector was mainly evident in the creation of new forms of intra-system

interactions and new scientific foundations designed to provide state support (Semenov, 2007). The main objective of the established foundations was to support innovative scientific projects on a competitive basis. Decisions on the allocation of funds reflected the conclusions of expert commissions, which consisted of prominent scientists in the relevant scientific areas. In particular, individual scholarships were awarded to young scientists within the framework of the funds. The Academy of Sciences, which was almost completely independent in economic matters following the systemic changes of the 1990s, was able to survive as a self-governing and self-developing community of scientists: "The 1990s were a difficult period for Russian science, but there were also advantages. Science was not so much bureaucratised, and those laboratories that had the potential could successfully develop" (Urmantseva, 2017).

Active reforms were carried out in the education system. In accordance with Law on Education adopted in 1992, educational institutions were granted broad academic and economic autonomy (Zaretskaya et al., 2002), which enabled higher-education institutions to survive and adapt in the face of drastic cuts in funding. Notably, however, due to the difficult economic situation and the decline in the prestige of scientific studies, the number of students pursuing a higher education fell from 1992 to 1996 (see Table 2.10). Young people were no longer interested in completing a higher education. Instead, they sought to derive an income by buying and re-selling certain items (Zhukova, 2016), or by emigrating (Semenova, 2016).

Table 2.10. Number of students in higher-education institutions, in thousands

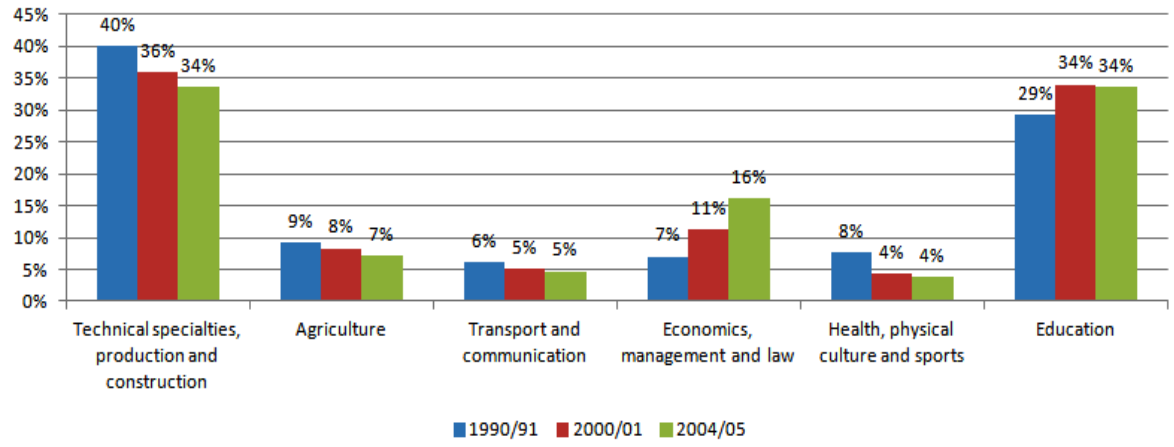
1970/71	1975/76	1980/81	1985/86	1990/91	1991/92	1992/93	1994/95	1995/96	1996/97	1997/98	1998/99	1998/99
2,671.7	**2,856.9**	**3,045.8**	**2,966.1**	**2,824.5**	**2,762.8**	**2,638.0**	**2,612.8**	**2,790.7**	**2,964.9**	**3,248.3**	**3,597.9**	**4,073.0**

Source: Rosstat, 2016

On the basis of the new law, non-state-sponsored universities began to open in 1993, and began providing training for a fee. Their number quickly skyrocketed, rising from 78 in the 1993/94 academic year to 409 in the 2004/05 academic year (Rosstat, 2016), thereby creating competition in the educational-service sector. Deregulation also provided higher-education institutions with more freedom to change the content of educational programmes. In general, students had access to a broader educational and training profile than during the Soviet period. The new variability in educational content on the education market led to the emergence of high-quality, progressive programmes as well as poor-quality, pseudo-education services (Zaretskaya et al., 2002).

In the early 1990s, educational programmes in management were made available (Kumpen, 2008). In response to distinct market needs, higher-education institutions also increased the number of programmes in economics and law (see Figure 2.7). In general, education in these specialties was offered on a fee basis. Moreover, state institutions of higher education introduced extra-budgetary programmes that provided training on a tuition-fee basis in those educational areas that were most in demand (Zaretskaya et al., 2002). At the end of the 1990s, executive-development programmes in the field of management (built on the Western MBA model) emerged and grew in popularity. The crisis of 1998 brought serious economic destabilisation, including the loss of a significant part of the capital held by the corporate sector and private savings held by individuals (Krivobok, 2011). However, it did not lead to a drop in demand for education. On the contrary, it stimulated growth in the demand for paid educational programmes for the adult population, especially in the spheres of economics, management and law. MBA programmes were approved by the Ministry of Science, Technology and Higher Education in 1999, and have since been singled out as a special type of postgraduate education (Kuzminov, 2004).

Figure 2.7. Share of students in Russian universities in various areas of training



Source: Rosstat, 2016

In terms of higher-education institutions' adaptations to the new economic conditions, market demand adjusted the supply and distribution of resources without external intervention. Higher-education institutions also assisted in correcting one of the Soviet Union legacies (i.e., the lack of personnel trained in the field of management). While the scientific institutions were dying out, higher-education institutions continued to develop. At times, they did so by enticing individual scientists from Russian Academy of Sciences to join their faculties.

The reform of the Russian higher-education system was greatly influenced by the methodological and financial support provided within the framework of the Programme for Trans-European Cooperation in Higher Education (Tempus) (Zhukov et al., 2000). From the beginning of the reform movement, the integration of Russian education with the existing system of European education was in focus. In 1996, the federal law "On Higher and Postgraduate Professional Education" provided for the establishment of bachelor's and master's degrees in higher education while maintaining the five-year specialist degree that had been introduced under the Soviet system.

On the whole, the period from 1991 to 1995 related to the survival of science and education in the post-*perestroika* period. Since 1996, this area has received special attention through a gradual increase in financing, and the implementation of systematic measures aimed at bridging the gaps among science, education, technological development and commercialisation. In 1996, a number of important policies were adopted that further determined the trajectory of this area of development.

Thus, the doctrine of the development of Russian science determined the most important principles of the state's scientific policy. The federal programme "State support of the integration of higher education and fundamental science for 1997-2000" put forward requirements to deepen and expand the interaction of academic and university science; improve the quality of education in order to preserve and develop the country's scientific and technical potential; develop joint fundamental research in higher-education institutions, the Russian Academy of Sciences, branch-based research institutes and state scientific centres; develop a fundamental research information base; develop an experimental and instrumental base for fundamental research for joint use by researchers, professors, students, graduate students and research organisations; and create conditions for enhancing the prestige of fundamental sciences in higher-education institutions. The Law on Science and State Science and Technology Policy determined the main objectives of the state's scientific and technical policy. The federal scientific and technical programme for 1996-2000 "Research and development in the priority areas of the development of science and technology for civil purposes" for the first time formulated a list of priorities for scientific and technological development and ranked the science and technology sphere among the top priorities of the Russian Federation. For the first time developed and adopted in 1998 innovation policy of the Russian Federation for 1998-2000 established the targets to increase the efficiency of scientific achievements, and to ensure that the results of fundamental and applied research move into production.

Entrepreneurial support

1991 to 1996 was a period characterised by spontaneous entrepreneurship, mainly related to the buying and re-selling of various items, including privatisation vouchers, often by illegal means. Such activities allowed people to survive in difficult economic conditions. As such, the Russian population studied entrepreneurship in practice.

The Law on State Support of Small Business in the Russian Federation was clearly a progressive step, as it defined small entrepreneurship, established requirements for the registration of entrepreneurial activity, laid the first methodological foundations for building complex programmes for the development of entrepreneurship, and provided for financing at the state and municipal levels. The Law on State Support of Small Business established the principles for small business support programmes in terms of organisation, implementation and financing. Moreover, it introduced zones of responsibility and control procedures. The federal authorities were responsible for developing appropriate conditions for the formation of an entrepreneurship framework, including improvements in the legislation. They were also expected to develop support programmes at the federal level, ensure that small enterprises could participate in public-procurement processes, establish fiscal incentives for small businesses and create mechanisms for providing support to small businesses through federal budgetary and extra-budgetary funds. Their area of responsibility also included monitoring and predicting small-business development, coordinating the activities of state organisations created for entrepreneurship development, providing methodical support to regional authorities in the implementation of support programmes for small businesses, and evaluating the effectiveness of the various programmes. The regional authorities and local government bodies were responsible for developing and implementing programmes to support small businesses in the relevant regions, and for developing proposals on promising areas and priorities for the development of small businesses, including suggestions for fiscal measures at the local level. The support programmes were financed through federal, regional and local budgets, and through other extra-budgetary sources.

In 1999, a set of state measures was adopted to support and promote innovation activities among small enterprises in the sphere of material production. Such innovation was needed to provide the country with consumer goods and services, which were in short supply in the pre- and post-*perestroika* years. This was a first step towards creating a roadmap for determining tasks for virtually all federal executive bodies, including the ministries. This set of measures prioritised support for innovative small enterprises in Russia's traditional

sectors: the food industry, including the processing, storage and packaging of agricultural and food products; the machine-building, metalworking and woodworking industries; the microbiological, medical and biotechnological industries; the electronics industry; the construction industry; and the fabric- and clothing-production industries.

Commercialisation infrastructure

In this period, no systematic efforts to build a system for supporting commercialisation were visible. The first technoparks were created through local initiatives launched by individual institutes with well-developed technological faculties and close ties to the industrial enterprises located in their regions. They included a park in Tomsk established by the Tomsk State University (1990), and parks in the Moscow region at the Moscow Institute of Electronic Technology (Technopark Zelenograd, 1992) and the Moscow Engineering Physics Institute (Technopark in Moskvorechye, 1993). This allowed NIS actors to gain some experience, which was later used to create the system of technoparks.

Among the most significant achievements that had an impact on the emergence of innovative activity in the focal period were the creation of the Foundation for Assistance for Small Innovative Enterprises in the Scientific and Technical Sphere (the Bortnik Foundation) and the establishment of the Centre for Technological Development. Among the Bortnik Foundation's main tasks were the creation and development of infrastructure for supporting small enterprises in the scientific and technical sphere; the creation of new jobs to effectively use of Russia's scientific and technical potential; the provision of financial, information and other assistance; activities to ensure the involvement of young people in innovation; and work to attract extra-budgetary investments in the sphere of innovative entrepreneurship. The state institution Centre for Technological Development was established to provide financial support for science and technology projects and experimental development through targeted loan financing. The foundation provided financial and consulting support for Russian organisations' science and technology projects and experimental development, and provided a framework for international scientific and technical cooperation.

Information and transparency

The biggest problems in the first phase of NIS creation were the informational asymmetries among reform participants, and the almost complete absence of information and lack of accountability among the public administration. The latter had grave consequences in the form of a lack of trust in government decisions and state officials, who

had been perceived as a source of corruption even during Soviet times. Moreover, during the most dramatic economic reforms of the first phase, the Russian Academy of Sciences was not involved as a consultative body with the exception of a few economists who acted as advisers to the committees and commissions of the Russian government. Based on the assumption that Russian scientists did not have the competencies necessary to ensure a rapid transition to a market economy, foreign experts[8] active in international assistance programmes often served as consultants to Russian officials on issues related to economic development. The Russian scientific community repeatedly criticized the actions carried out by officials, claiming that they were based on political rather than economic considerations, but its opinion was not taken into account. This led to a rejection of the methods of economic transformation and opposition among scientists, which continues to this day (Vladimirov, 2013).

Implications for innovation and networking

The above discussion demonstrates that the first phase of the Russian NIS's development was the most turbulent in terms of the depth of the changes occurring, the absence of experience and the lack of a systematic understanding of methodological approaches to NIS development. However, it laid the foundations for its further development in terms of addressing the issues underlying the innovative pyramid (see Figure 1.18) and defining the basic conditions for social life.

The initial stage (until about 1996) was the most difficult. Several researchers (e.g., Hunter, 2003) describe the state of the economy as chaotic, as it was characterised by political instability, poor infrastructure, a legislative vacuum, corrupt bureaucracy and various types of crime, including racketeering and extortion. Much of the scientific base was destroyed and state actions were mainly aimed at preserving what was left. The outflow of highly qualified specialists, scientists and engineers created gaps in the knowledge-generation structure, and further exacerbated Russia's scientific and technological backwardness. Opaque privatisation, the increase in crime during the most difficult transitional years, the subsequent merger of the criminal community with the state

[8] Several instances of such international cooperation were subsequently viewed as scandalous. For example, professor-economist Andrei Shleifer and lawyer Jonathan Hey worked in Moscow in the 1990s, where they held the positions of economic advisers to the Russian government. They provided advice on the accelerated transition of Russia to a market economy within the framework of the Harvard Institute for International Development's programme. In 1997, Shleifer and Hay were excluded from this programme and the institute was closed in 2000. In 2002, a criminal case was initiated in the United States related to corruption and the illegal use of insider information by Schleifer and Hey for personal enrichment in the course of providing services to the Russian government (Shenin, 2008).

system (Estrin et al, 2008), extensive corruption among officials, and restricted access to information (Bayer, 1995) led to a lack of trust among participants in the economic system.

This period can be described as a great opportunity for entrepreneurship because the market was neither oversaturated nor overly competitive (Bayer, 1995). On the other hand, business activities were associated with extremely high risks, a lack of financing, and the absence of technology, knowledge and resources that accompanied the ruined economy.

Nevertheless, during this period and in the second stage (1996-1999), nascent democratic institutions began to emerge, the initial framework and infrastructural foundations of innovation appeared, and attempts were made to improve the damaged knowledge base (simultaneously revitalising scientific development and rearranging the education system) and to restore the disrupted links between science and industry. The first NIS development institutions emerged, although they were fragmented and did not cover the entire range of tasks. Some programmes to support entrepreneurship, which could not be called systemic, were implemented. They were generally aimed at assisting the development of traditional entrepreneurship and were designed to address the consumer-goods shortages. Thus, the first steps toward creating the foundations of the innovation pyramid (see Figure 1.18) were taken.

In this period, the principles of regional management were beginning to form, which fundamentally changed the system of business relations. While business ties were previously highly centralised and business issues had to be negotiated at the ministry level, decision making devolved to local governments and companies (Bayer, 1995). At the same time, vertical business relations, which were initially inter-regional because of the industrial principle of building the economy, were destroyed. Consequently, the regions' industrial capabilities generally declined, such that the emergence of several territorial clusters was an exceptional development.

The absence of a large number of actors in both the national and regional innovation systems; the lack of horizontal and vertical links between existing economic players, most of which were weak and insolvent (Hunter, 2003); the damaged scientific base; the underdeveloped commercialisation infrastructure and governance system, including the imperfections in the legislative system, support programmes and government policies; the absence of shared information and means of communication; the uncertainty surrounding the general direction of the country's development; and the non-complementarity and narrow specificity of skills were exacerbated by the different approaches to assessing the

changes, as well as the different values and cognitive frames of scientists, engineers and industry representatives. Other challenging factors were the negative attitude towards entrepreneurship (perceived as unfair enrichment through the reselling of goods accessed through *svyazi*), the low level of trust, and the growing social problems, which focused people on survival rather than on the development of long-term projects based on innovation. To a large extent, entrepreneurs formed informal business relations, and relied on people they knew and trusted (Michailova and Worm, 2003). Neither a legislative base nor an enforcement system existed for the formalisation of business relations. As result, the practice of doing business in this period focused on *blat*-based relations and s*vyazi*, as described in Section 1.2.11. Given the economic situation, this approach was the most cost effective and entailed the least risk.

Phase 2: 2000 – 2005

Governance

The main efforts in this period aimed at establishing stable framework conditions for doing business in Russia. As such, this phase focused on the systematic construction of the foundations for the creation of the Russian NIS. The basis was laid for the successful integration of Russia into the international economy by ensuring compliance with international standards in such areas as legal regulation, financial and banking activities, and education.

At the federal level, a large number of state programmes were created and launched to develop the business infrastructure, improve the legal framework and fiscal policy, and provide the population with social protections and financial stability (see Appendix 2.1). In 2005, the main directions of the Russian NIS's development intended to cover the period up to 2010 were introduced. The document included definitions of key terms in the field of innovation, as well as key goals and objectives. The fundamental principle was to use public-private partnerships as the main engine for the NIS's development with the aim of combining the efforts and resources of the state and business sectors. The document also established criteria for assessing the success of the NIS's construction. The main directions of state policy in the field of NIS development were to create a favourable economic and legal environment with respect to innovation activities, to develop the infrastructure of the innovation system, and to create a system of state support for the commercialisation of the results of intellectual activity.

In the focal period, officials from virtually all levels – from the president to the ministries and state organisations to specialists – actively studied best practices from an international

perspective through numerous business visits and internships abroad. The result was a qualitative leap in the depth of the elaboration and systematic nature of state documents and policies that appeared after the year 2000. These international experiences gave rise to experiments with new initiatives and led to the introduction of new projects. For example, a visit by Russian President Vladimir Putin to the headquarters of Infosys in Bangalore laid the grounds for the active implementation of the programme for the creation of special economic zones (SEZ) in Russia (Sergeev, 2006).

The most significant governance actions in terms of the development of NIS in the focal period are summarised in the Table 2.11 and Appendix 2.1.

Table 2.11. Formation of the foundations of the Russian NIS in the second phase, 2000-2005

Aspect of NIS foundation building	Key initiatives
Development of economic infrastructure	A series of federal programmes for the period 2002-2006 aimed at: modernisation of the transport system, the building of an energy-efficient economy, the renewal and development of residential properties and commercial real estate, etc.
Development of the information space	The Doctrine of Information Security of the Russian Federation and a series of federal programmes for the period 2002-2006 aimed at developing the information space: e-Russia, a special-purpose information and telecommunications system to support public authorities, and a united educational-information environment.
Resolution of social problems	A series of federal programmes for the period 2002-2006: Children of Russia, Youth of Russia, Senior Generation, social support for disabled people, Culture of Russia, the fight against socially significant diseases, etc.
Development of juridical, tax and law-enforcement systems	Federal programmes for 2002-2006 aimed at developing the Russian judicial system and tax authorities, reforming the penal system, etc. Introduction of federal law on insolvency (bankruptcy)
Development of banking system	Establishment of a deposit-insurance system on the basis of the Federal Law on the Insurance of Individual Deposits in the Banks of the Russian Federation, which determined the basic mechanisms for protecting the population's savings. The introduction of the deposit-insurance system was preceded by a thorough analysis of the financial soundness and management quality of each bank that applied for entry into the system. The assessment methodology and the deposit-insurance system itself were based on the recommendations of the Basel Committee on Banking Supervision of the Bank for International Settlements.
Focus on even development of regions	A series of federal programmes for the period 2002-2006 aimed at developing regions in Russia and supporting ethnic minorities.
Development of the educational, scientific and technological spheres	Adoption of Educational standards for higher education (second generation), Federal programme "Integration of science and higher education in Russia for 2002-2006", Fundamentals of the policy of the Russian Federation in

	the development of science and technology for the period until 2010 and beyond. The signing of the Bologna Declaration on the European space for higher education, which initiated the modernisation of Russia's education system on the basis of the principles of the Bologna Process. Creation of the Federal Agency for Science and Innovation. Approval of "Fundamentals of the policy of the Russian Federation in the field of science and technology development for the period until 2010 and further prospects". Federal programme for the development of education for 2006-2010.
Development of state procurement system	Introduction of the law on the placement of orders for the supply of goods, the performance of work, the provision of services for state and municipal needs.
Initiation of construction of commercialisation infrastructure	Establishment of a non-commercial partnership "Russian Technology Transfer Network", an innovative infrastructure tool that aimed to improve the efficiency of technological information dissemination through allowing for search for partners in the implementation of innovative projects. Introduction of the Law on Special Economic Zones in the Russian Federation

Source: Developed by the author

Entrepreneurial support

In accordance with the Law on State Support of Small Business in the Russian Federation, the first wave of small business-support programmes was developed and implemented on the regional level. These programmes led to the growth of small enterprises, and an increase in the volume of products and services (see Table 2.12). The 1998 crisis, the devaluation of the RUB and the corresponding sharp rise in the price of imported goods led to a 62% increase in the volume of products and services sold by small enterprises in 1999. The measures aimed at developing small business provided an average annual increase in production among small enterprises of about 40% per year in the focal period.

Table 2.12. Indicators of growth among small enterprises during phase 2

	1998	1999	2000	2001	2002	2003	2004	2005
Number of small enterprises (at the end of the year), thousands	868	890.6	879.3	843	882.3	893	953.1	979.3
Average number of employees, thousand people	6,207.8	6,485.8	6,596.8	6,483.5	7,220.3	7,458.9	7,815.1	8,045.2
Investments in fixed assets, RUB bn.	19.3	17.9	29.8	43.5	51	67.3	99.2	120.5
Number of small enterprises per 10,000 people	59	61	61	59	61	62	66	69

Source: Rosstat, 2006

In accordance with government's plan for innovative development, the key tasks of regional entrepreneurship-support programmes at the end of this period were increasingly integrated with the task of developing the innovation infrastructure to foster the emergence of innovative enterprises.

Support for R&D execution

In this period, systematic work began on the restoration of research and technical capacity. The main goals of this stage were to develop Russia's scientific, technical and human resources, and to successfully transition to a market economy. The latter entailed the introduction of a new way of thinking in a post-industrial society, which also involved borrowing best-practices on an international scale and integrating the Russian scientific community with its international counterpart.

Within the framework of the federal programme "Integration of science and higher education in Russia for 2002-2006", which was a continuation of the previous programme on the integration of the scientific research of Russian Academy of Sciences (RAS) organisations and higher-education institutions (1997-2000), measures were implemented to stimulate an increase in domestic and international mobility. Grants were awarded on a competitive basis to use for organising scientific competitions, international schools and conferences for students, graduate students, young teachers and staff of higher-education institutions and scientific organisations. Young researchers and scientists from universities and RAS scientific organisations were actively chosen to participate in scientific internships in leading educational, scientific and technical centres abroad. Faculty members and scientists also received funding to participate in international conferences and symposia.

In this period, much attention was paid to the development of an experimental and instrumental base in the sphere of science and higher education, and to the development of information technologies in the scientific and educational field on the basis of a united information platform for scientific, higher education and innovation activities. In 2005, eLIBRARY.RU, which was created in 1999 by the Russian Foundation for Basic Research (RFBR), started working with Russian-language publications. It is currently the leading electronic library of scientific periodicals in Russian in the world. Moreover, in 2005, the company "Scientific Electronic Library" launched a project aimed at measuring the impact of Russian publications, known as the "Russian Index of Scientific Citation" (RINC).

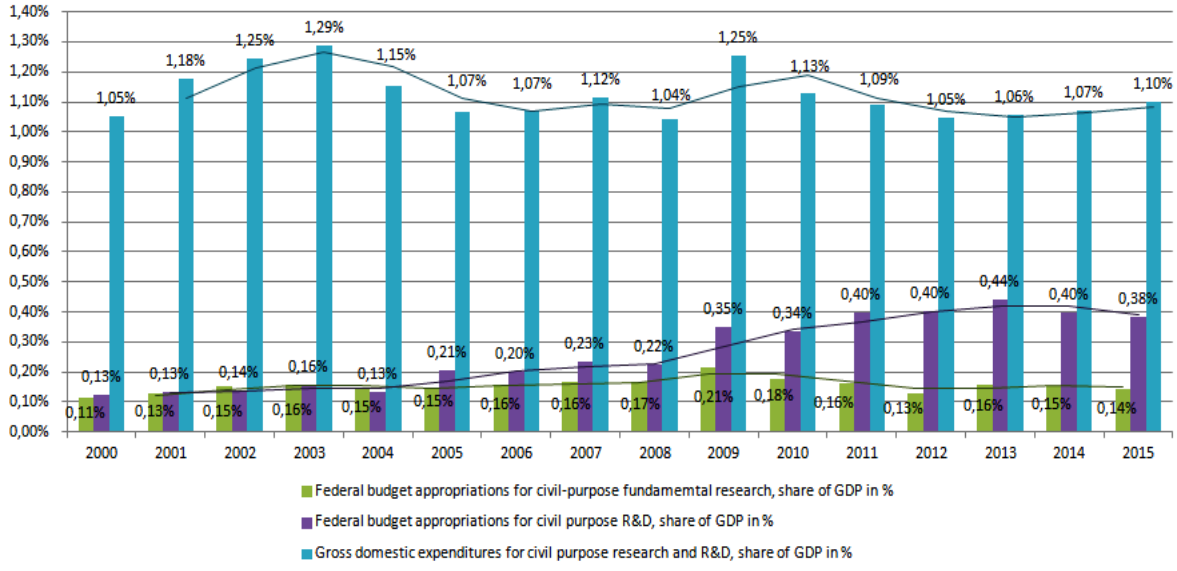
The policy document entitled "Fundamentals of the policy of the Russian Federation in the field of science and technology development for the period until 2010 and further prospects" marked the transition from preserving the scientific and technical potential to its active formation. This was achieved through a combination of state regulation and market mechanisms; direct and indirect stimulation of fundamental scientific, R&D, technical and innovation activities; improvements in the regulatory and legal framework for fundamental

scientific, R&D, technical and innovation activities; work to ensure the interaction of public and private capital for the development of science, R&D and technology; improvements in the system for training scientific and engineering personnel; the advancement of research in higher-education institutions and universities; intensification of the transfer of knowledge and technology between the defence and civil sectors; and development of dual-use technologies and the expansion of their use.

In general, the documents adopted in this period aimed to develop and use scientific and technical potential as a foundation for the creation of the Russian NIS. The main objectives were to increase innovation activity by ensuring that producers were receptive to innovations and new technologies in order to diversify and increase the competitiveness of the Russian economy, and to develop mechanisms for utilising state and non-state resources for the creation and commercialisation of domestic technologies.

In this period, the government's funding of civilian science rose (see Figure 2.8). This included an increase in the state funding allocated to R&D in order to boost technological development and commercialisation.

Figure 2.8. Funding for civilian science and R&D in Russia



Source: Rosstat, 2016

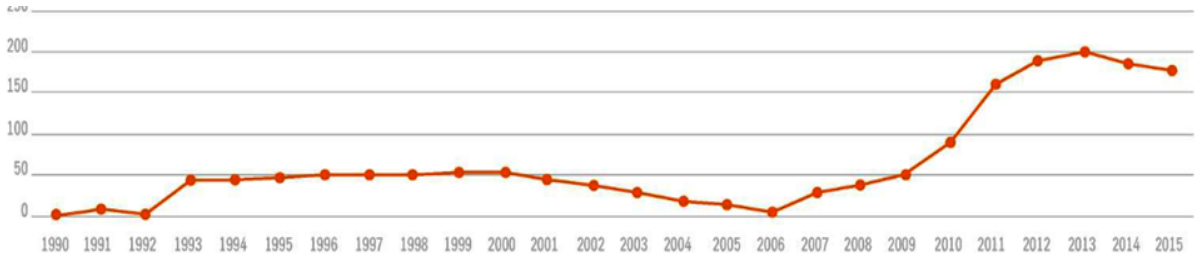
In addition, a Federal Agency for Science and Innovation was established to manage state properties involved in fundamental scientific, R&D, technical and innovation activities. Organisations receiving services from the agency included federal science and high-tech centres, state research centres, unique experimental platforms and R&D facilities, federal centres for collective use, and a national research computer network for the new generation aimed at providing information support for scientific, technical and innovation activities.

Moreover, the reform of higher education continued. In 2000, the new state educational standards for undergraduate and graduate schools (second-generation standards) were approved and put into force. All state educational institutions were required to conduct training in strict accordance with the standards and this compliance was to be checked every five years through a national accreditation procedure. Notably, these standards required teaching staff to carry out research, and to ensure a link between their results and the curriculum. However, the approach to determining course content reflected the Soviet view that education should convey a certain amount of knowledge. Therefore, the standards strictly regulated the set of disciplines and their content. In 2003, Russia signed the Bologna Declaration, which created major opportunities for Russian universities and the academic community in terms of academic mobility, international recognition of diplomas (TatCenter.ru, 2005) and a transition to more progressive methods of teaching aimed at forming educational competencies rather than studying a predetermined set of topics. At the same time, the reforms connected with the Bologna process caused a wave of discussion and critique related to the perceived danger of losing the Russian higher-education tradition (TatCenter.ru, 2005).

Commercialisation infrastructure

Technoparks continued to emerge through local initiatives undertaken by technological and polytechnic universities. By the year 2000, 50 technoparks had been established in Russia. At the same time, there was no methodological understanding of how a technopark should function, such that "everyone was doing what he considered right" (Shpilenko, 2016). The absence of a clear legal definition of the concept, government support or a business model, as well as the lack of understanding of the goals and tasks of technoparks meant that most of the technoparks disappeared by 2005. The dynamics of the creation of Russian technoparks are highlighted in Figure 2.9.

Figure 2.9. Number of technoparks in Russia, 1990-2015



Source: Shpilenko et al., 2016

New entities designed to support the development of commercialisation, such as SEZ and science cities, were also emerging. SEZs and science cities were designed to create focal

points for the growth of innovation on a regional basis, which was extremely important given Russia's geographical span. At the same time, they were intent on solving the social problem of supporting mono-cities in which life was built around a single city-forming scientific or production centre.

The main objectives of the SEZs were to increase the efficiency of local economies, and to foster the social and infrastructural development of the territories in which they were located. An SEZ's resident companies enjoyed customs, tax and other benefits. An SEZ's most important mission was to strengthen the relations between the national and international economies by attracting investments—domestic as well as foreign. They did so by ensuring beneficial conditions for doing business. As a result of this programme, four types of SEZs had been created by 2017: industrial production (seven zones), technical and innovative (based on the largest Russian technoparks; five zones), tourist-recreational (three zones) and ports (one zone) (RUSSEZ, 2017).

The first science cities were established in accordance with the federal law "On the status of the science city of the Russian Federation". In the Soviet period, settlements were created to implement the state's strategically important projects. For example, Dubna (Moscow region) was home to Russia's largest centre for research in nuclear physics. Obninsk (Moscow region) was a multi-centre. It brought together scientific institutes with physical, chemical, medical, meteorological, seismological and agricultural profiles. Korolev (Moscow region) was the centre of the rocket and space industry, and home to the relevant research and experimental production complexes. Typically, such settlements were built some distance from the main cities and had their own infrastructure. During the *perestroika* and privatisation periods, these centres began to struggle owing to the absence of funding. Research institutions closed, scientists and engineers were dispersed, and the settlements almost died out. The three centres mentioned above were the first to receive the status of "science cities", which was issued for a period of 10 years. Currently, 13 cities hold this status: Biysk, Chernogolovka, Dubna, Fryazino, Koltsov, Korolev, Michurinsk, Obninsk, Protvino, Pushchino, Reutov, Troitsk and Zhukovsky (Gusev, 2016).

Information and transparency

This period was characterised by active growth in the use of information technology, which become an integral part of all spheres of activity. The IT-services market was growing, and that growth included the creation of websites for various public and state institutions. The databases of legal documents begin to appear online, the number of

Internet news portals increased, professional resources for information exchange and document circulation emerged, and electronic libraries appeared in Russian. All of these factors contributed to increased transparency (Vasiliev and Levochkina, 2012). At the same time, the websites of state organisations were far from perfect – the information on them was not always up to date, and phone calls or visits remained the main ways to obtain necessary information.

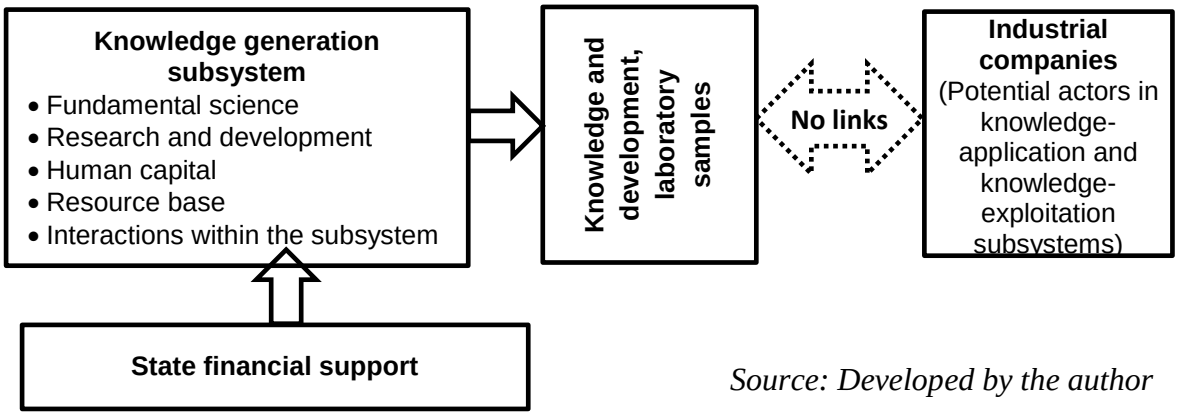
The Information Security Doctrine of the Russian Federation, which was adopted in 2000, pointed to the expansion of the application of information technologies as a key factor in accelerating the country's economic development and the formation of the information society. The doctrine simultaneously highlighted that this shift generated new information threats that needed to be considered. In this period, therefore, approaches to the formation of an open information space were only beginning to be developed.

Implications for innovation and networking

In general, the second phase encompassed the formation of the three fundamental layers, as shown in Figure 1.18. This phase included the creation of legislative, public and social framework conditions (layer I), the restoration of the material and intellectual resource base needed to enable the commercialisation of R&D outcomes (layer II), and the development of a vision for the role of innovation in the country's development (layer III).

In many respects, this period can be called the "primary school" of building an innovation system in Russia, as all participants learned – sometimes through trial and error, but mainly by studying Western experiences and adapting them to the relatively unformed systems and institutions of the Russian NIS. This led to contradictions, inconsistencies and grand statements that were recorded on paper but were never transformed into reality. For example, the declaration highlighting the need for interactions between private and state capital did not lead to significant inflows of private financing to the NIS, as there were no corresponding mechanisms, such as a venture industry. Similarly, increased state funding for science did not lead to a diffusion of innovation or an increase in the introduction of scientific developments in industries owing to gaps among the knowledge-generation, knowledge-application and knowledge-exploitation subsystems due to absence of mediating organisations (see Figure 1.16). Moreover, there was little need to engage in innovative cooperation due to the lack of demand from companies, in part because innovation was not widely viewed as a source of competitive advantage in the unsaturated Russian market (see Figure 2.10). In addition, dependence on imported materials and components perceived as being more reliable and affordable was growing (see Table 2.12).

Figure 2.10. The separate existence of subsystems



Source: Developed by the author

For the significant part, scientific research and development were carried out in areas of interest to scientific collectives. However, considerations about the need for the results or how they could be commercialised were not taken into account. From the perspective of researchers and scientists, scientific developments had value in themselves. Researchers and scientists did not consider the commercialisation factor, as it had not historically been part of their cognitive frameworks. Similarly, the possibility of commercialisation was not viewed as important when making decisions about the allocation of financial support. This highlights gaps in the NIS system at the conceptual level given the lack of links among its internal elements and the absence of incentives for the subsystems to cooperate for the purpose of innovation. This problem concerned innovation systems at both the country and regional levels, where entrepreneurship failed to systematically develop and state programmes commonly supported initiatives for entrepreneurs among the nation's youth and in unprotected strata of the population (e.g., the disabled, veterans, ethnic minorities) with the aim of reducing social tension.

The financial crisis of 1998 and the instantaneous result of uncompetitive prices for imported goods created market opportunities for SMEs, which led to an increase in the number of enterprises dealing not only with the resale of foreign goods on the Russian market but also with production. However, the number of high-tech companies remained low, mainly because of the underdeveloped commercialisation infrastructure, the unavailability of financing, and the lack of experience in conducting technological entrepreneurship, which together resulted in the perception that starting a high-tech business was risky.

A positive trend in this period was the rapid development of the Internet and various forms of communication, which made information more accessible and, thereby, reduced transaction costs to some extent. At the same time, interactions with state organisations,

especially regulatory bodies, remained extremely inefficient due to the extensive bureaucracy as well as the lack of transparency of procedures and rules, which led to high costs and promoted corruption as a tool for accelerating decision-making processes. The NIS system still lacked the necessary actors, including NIS-development organisations that were needed to handle various aspects of NIS governance, including system design, the coordination of actors' activities, the development of a conceptual apparatus, and the stimulation of a common understanding of the objectives and mechanisms of innovation. These organisations were also needed to create motivation for innovation both among business organisations and the general public.

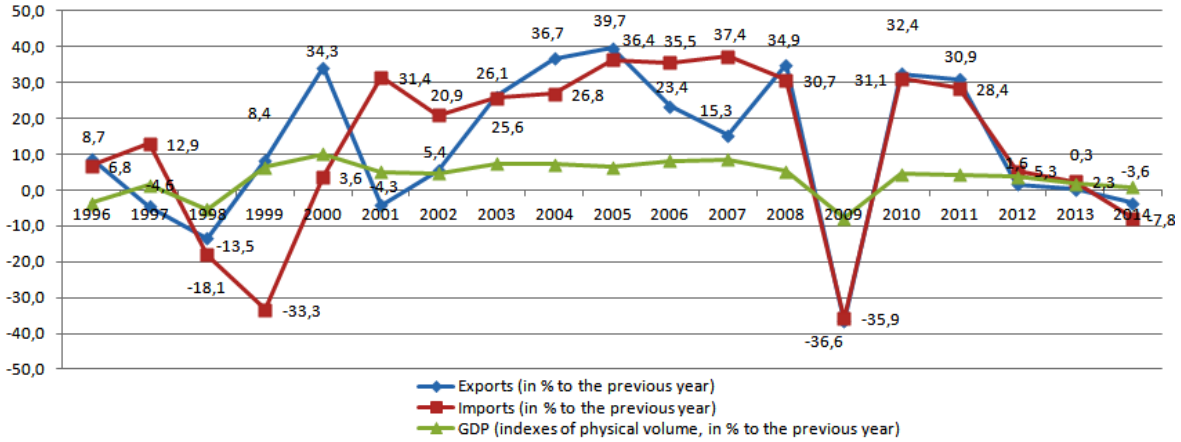
The extant literature (Huter, 2003; Ledeneva, 2008) identifies several key features of the Russian economy in this period: the instability of the social safety net; weak infrastructure; poor protection of private property rights; growing demand but low levels of competition; arbitrary regulation; underdeveloped institutions (e.g., capital markets, the rule of law); the relative lack of skilled economic actors; outdated management practices built on *blat* relations that provided access to administrative resources (Ledeneva, 2008), which were unfavourable for the efficient conduct of business; the weakness of civil society; and a low level of trust in public institutions. Ledeneva (2008) points out that informal relations were widespread. This was evident in the use of informal networks to compensate for the inefficiency of official organisations and to close the structural holes caused by the lack of certain institutions and mechanisms, and in the high level of interpersonal trust, which served as a substitute for the low level of trust in state institutions. The latter led to the personalisation of bureaucracy and the creation of clan relations that were supportive of the emergence of "administrative resources" as one of the most important factors in business in Russia. Thus, the presence of personal, informal ties in one of the influential clans was the key for successful business development. Competitiveness did not matter – it was important to have *svyazi*. Relationships were managed on a personal level, which was difficult and costly owing to the accompanying mutual obligations. However, these relationships were vital, as the clan system meant that businesses did not need to participate in market competition (Ledeneva, 2008) and could function without any investments in innovation or development.

Phase 3: 2006 – 2008

The economic growth achieved from 2000 to 2008 through the increase in commodities exports led to an expansion of imports (see Figure 2.11), including imports of advanced

technological products and components. This laid the foundation for technological dependence on developed countries in certain fields, such as pharmaceuticals, high-tech machinery and equipment, vehicles, aircraft construction, and oil production (Gokhberg and Kuznetsova, 2016).

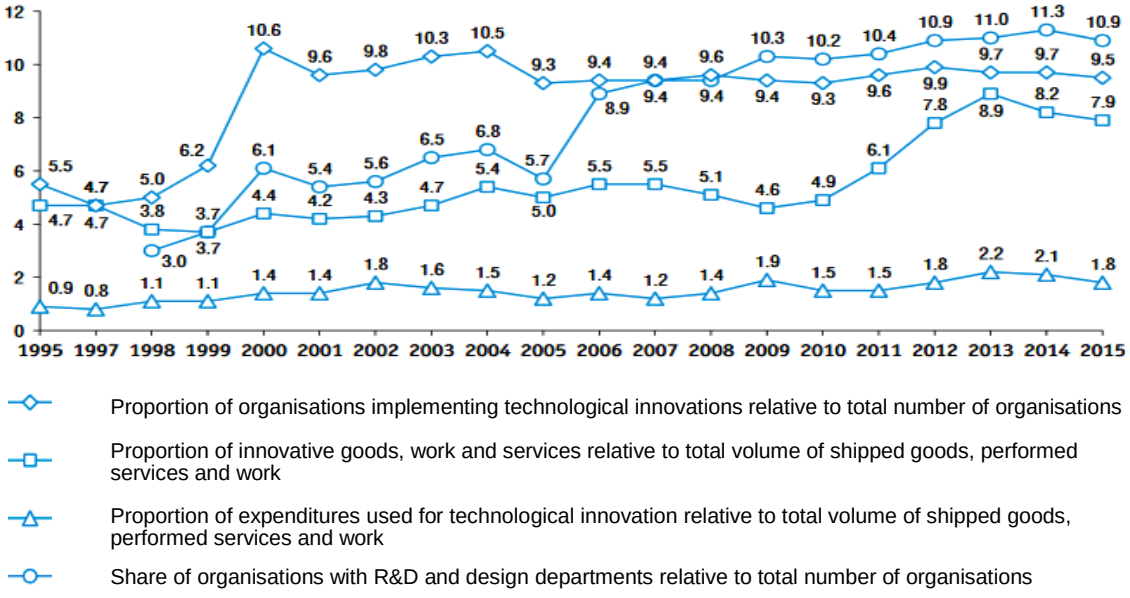
Figure 2.11. Percentage change from previous year in exports, imports and GDP



Source: Rosstat, 2016

Paradoxically, the rapid economic recovery undermined the motivation of enterprises to modernise and innovate, as shown in Figure 2.12.

Figure 2.12. Innovative activity in mining, manufacturing, production, and distribution of electricity, gas and water



Source: Gorodnikova et al., 2017

Governance

The third phase (2006-2008) was devoted to developing an understanding of various approaches to innovation management at the state, regional and organisational levels. It included the development of a state innovation policy that ensured the systemic influence of the state on the development of science and innovation in Russia.

A set of measures was implemented to develop framework conditions for successful commercialisation of innovations, including measures intended to stimulate venture-market development; develop a technological base in the form of technoparks; create state corporations designed to identify and commercialise technological solutions; improve intellectual property rights; create favourable tax conditions for financing innovative activities; and create conditions for the privatisation of leased property by small and medium-sized enterprises. In addition, laws were adopted to ensure competition and combat corruption.

The key document that defined the conceptual approach to the selection of activities in this phase was the Strategy for the Development of Science and Innovation in the Russian Federation for 2006-2015. This document summarised the results of the previous development phases, and highlighted key problems in the scientific and innovative spheres. It also noted that Russia's lagging innovation-performance indicators compared to leading countries were dangerous because of potentially damaging effects on national competitiveness in the global markets for science-intensive products. The document implied that if appropriate measures would not be taken there was a possibility of an irreversible backlog in Russia's undertaking a continual transition to a new technological era. Remaining within the paradigm of "technological push", the strategy identified a systematic problem – the pace of development and the structure of the Russian R&D sector did not fully meet the requirements of the national security system or the growing demand from a number of business segments for advanced technologies. At the same time, the scientific results of the Russian R&D sector that were relevant on a global level were deemed inapplicable to the Russian economy due to the imbalance in the NIS and the generally low acceptance of innovations visible in Russian business enterprises.

The goals of the strategy were to form a balanced R&D sector, create an effective NIS that would ensure the technological modernisation of the economy and increase its competitiveness on the basis of advanced technologies, and transform scientific potential into one of the main resources for sustainable economic growth. It was assumed that the main task in this period would be to create an effective NIS that would be integrated with the global innovation system. The NIS was expected to ensure the interaction of the R&D sector with the domestic entrepreneurial sector, and its key parameters were meant to correspond to those of developed countries' innovation systems. The strategy formally prioritised several technological areas that had traditionally been highly developed in Russia: aircraft engineering, space exploration, nuclear energy, IT and specialised high-

tech medical services. Other prioritised areas included optoelectronic devices, new energy sources and ways of reducing energy use, and high-tech materials.

The most significant governance actions in terms of the development of NIS in the focal period are summarised in the Table 2.13 and Appendix 2.1.

Table 2.13. Development of NIS in the third phase, 2006-2008

Aspect of NIS building	Key initiatives
Further development of the educational, scientific and technological spheres	▪ Adoption of the Strategy for the Development of Science and Innovation in the Russian Federation for 2006-2015 ▪ Adoption of the federal programme "Research and development in priority areas of development of Russia's scientific and technological complex for 2007-2013" ▪ Adoption of the federal programme "National Technological Base for 2007-2011" ▪ Adoption of the federal programme "Scientific and scientific-pedagogical staff of innovative Russia" ▪ Issuance of the Presidential Decree on the implementation of a pilot project for the establishment of national research universities
Creation of the innovation system's resource base	▪ Adoption of the federal programme "Establishment of technoparks in the sphere of high technologies in the Russian Federation" ▪ Establishment of Russian investment fund for technology and innovation, known as the Russian Venture Company (RVC) tasked to develop venture market
Strengthening of entrepreneurial support	▪ The Law on the development of small and medium-sized enterprises ▪ Adoption of the Law allowing for the privatisation of leased property by small and medium-sized enterprises
Development of framework conditions	▪ Concept of long-term social and economic development through 2020 ▪ Adoption of the fourth part of the Civil Code, which determined the notions of intellectual activity results; legal protection of intellectual property; the legal status of authors of intellectual activity results; procedures for the state's registration of such results; and possible ways of disposing of the author's exclusive rights, including a license agreement that resolved issues of succession ▪ Amendments to certain legislative acts concerning favourable tax conditions for financing innovation activities ▪ Adoption of the Law on Protection of Competition, which defined the organisational and legal framework for the protection of competition, including the prevention and suppression of monopolistic activities and unfair competition; and prohibition, restriction and elimination of competition by authorities ▪ Adoption of the Anti-Corruption Law
Establishment of innovation system's development institutes	▪ State corporation "The Russian Corporation of Nanotechnologies" (RUSNANO) ▪ State Atomic Energy Corporation (Rosatom) ▪ State Corporation for Developmental Assistance to Production and Export of Advanced Technology Industrial Products (Rostec) ▪ Creation of the National Association of Business Angels
Development of information systems	▪ Adoption of the information society development strategy

Source: Developed by the author

In the focal period, a first attempt was made to build a programme for the long-term socio-economic development of the Russian Federation[9]. In accordance with a presidential directive resulting from a meeting of the State Council of the Russian Federation held on July 21, 2006, the "Concept of long-term social and economic development of the Russian Federation through 2020" was developed from 2006 to 2008. This concept was approved by the Russian government on November 17, 2008. The goal was to identify ways to ensure long-term (i.e., 2008-2020) sustainable improvements in the well-being of Russian citizens, national security, dynamic economic development, and the strengthening of Russia's position in the world. In accordance with this goal, the concept described the main directions for the country's long-term social and economic development, taking into account the likely challenges of the forthcoming period. It also detailed a strategy for achieving the set goals, including methods, directions and stages. Moreover, it defined forms and mechanisms for strategic partnerships among the state, business and society, as well as goals, target indicators, priorities and main tasks of long-term state policy in the social, scientific and technological spheres. In addition, it introduced structural changes in the economy, the goals and priorities of foreign economic policy, the parameters of the Russian economy's spatial development, and the goals and objectives of territorial development.

The approval of the concept coincided with the intensification of the global financial and economic crisis of 2008-2009. In fact, the concept was approved by the government after the economic crisis began in Russia. As a result, it was already outdated at the time of its adoption (Prokopenko and Bazanova, 2016). The crisis led to a sharp fall in economic indicators and made most of the quantitative targets set for the first stage of the concept's implementation (2007-2012) impossible to achieve. Similarly, the benchmarks provided by the Strategy for the Development of Science and Innovation remained unfulfilled.

Commercialisation infrastructure

One of the most significant events of this period was the creation of the first institutional organisations for the innovation system's development: Russian Venture Company (RVC) and RUSNANO. The operations of these organisations were based on a principle of cooperation between the state and the corporate sector aimed at ensuring the intensification of innovation processes. A second significant event was the creation of state corporations Rosatom and Rostec tasked with identifying existing, potentially promising scientific and R&D results, and ensuring their commercialisation.

[9] Prior to this, planning focused only on terms of three to five years.

Established by the Russian government in 2006, RVC was a fund of venture funds as well as the innovation system's development institute tasked with implementing state policy for the creation and expansion of the NIS. The RVC's main tasks were to develop a venture-investment market, introduce educational and methodological services for innovation-market participants, and assist in enhancing the competitiveness of Russian technology companies in the global marketplace. RVC was based on the model of the Israeli fund Yozma. It was responsible for selecting private management companies on a competitive basis to handle newly created venture funds and for co-financing those funds. RVC did not participate in the selection of financed start-ups – it ensured only that they matched one of the focal areas: nanotechnology, information technology, energy savings, rationalisation of environmental resource use, counterterrorism, and the transport, aviation and space industries (Mikhailova, 2008). The other significant event of this phase that contributed to the development of Russian venture market was the creation of the National Association of Business Angels, a non-profit partnership that brought together legal and physical persons, and private and institutional investors that invested in innovative high-tech companies as well as organisations providing services in the areas of investment and innovation.

The state corporation RUSNANO was formed to introduce a new technological sphere that did not exist in Russia but was emerging abroad (Dementiev, 2009a). Nanotechnology was expected to become a new growth point for Russia, just as nuclear and space technologies once were, and to help Russia preserve its status as a powerful state (Dementiev, 2009b). RUSNANO was responsible for implementing state policy for the development of the nanotechnology industry, and for investing directly or through investment funds in high-tech projects that could create new production in Russia[10].

Both RVC and RUSNANO used the established financing mechanisms to support projects that had passed the R&D stage and were ready for commercialisation. However, it soon became clear that the number of such projects was catastrophically small (Rashidov, 2012) and insufficient for conducting profitable investment activities. In order to increase the number of such projects, it was necessary to create a diversified venture market in which projects in the early development stages could find the financing necessary to prepare for the next-stage investments (Mikhailova, 2008). After the end of 2006, the Russian venture and direct investment market was actively developed: 68 funds were in operation in 2006, but this figure rose to 170 in 2010 and to more than 250 in 2015 (RVCA, 2009). Moreover,

[10] http://en.rusnano.com/

the number of private investment funds, including regional funds, rose, and angel investors actively took part in venture market development.

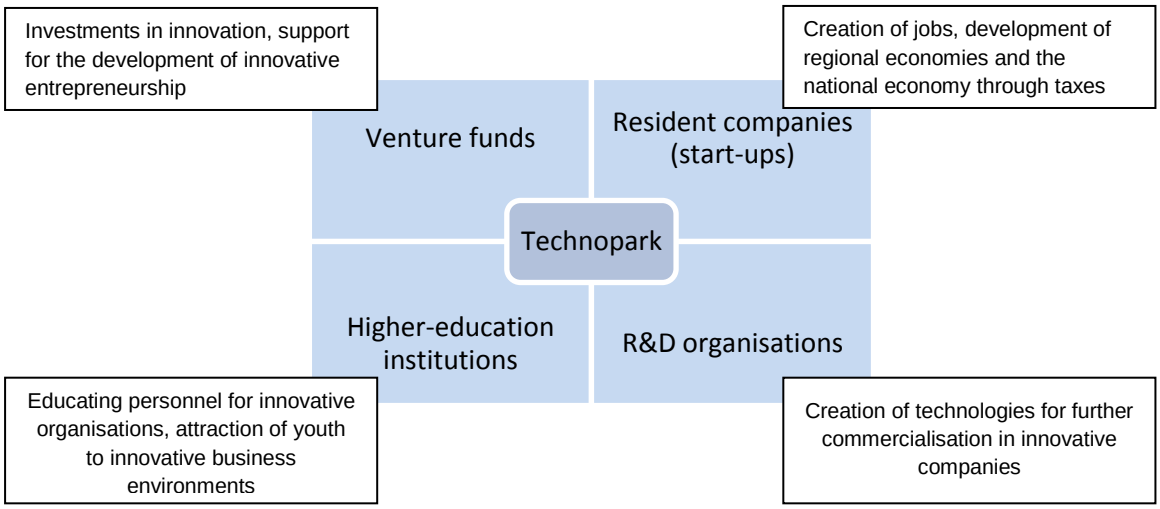
The creation of state corporations at this stage was aimed at increasing the efficiency of management teams in state industrial enterprises, and at ensuring the modernisation and competitiveness of these enterprises in the market economy. This was achieved by increasing their sensitivity to the results of scientific activity and, as a result, enhancing their innovativeness. For example, the state corporation Rosatom solved a wide range of issues in the atomic-energy field, including the need to establish relevant scientific and technical, investment, and structural policies. Rostec was established to manage existing enterprises that manufactured products for the defence industry and, in part, for the civil market under the conversion programme (Vasilieva and Drankina, 2012)[11].

A comprehensive state programme on "Establishment of technoparks in the sphere of high technologies in the Russian Federation" was developed and approved in 2006. Although the development of most of the technoparks basically started from scratch in terms of pre-project work, design work, construction and creation of basic infrastructure, the programme aimed to ensure the establishment of technoparks in the high-technology sphere by 2007. The goal was to motivate the world's leading high-tech companies to locate their production in the Russian technoparks by 2010 and to have the technoparks operating at full capacity by 2014.

In the focal period, technoparks in the high-tech sphere were viewed as a way to ensure the territorial integration of commercial and state higher-education and R&D organisations, as well as financial institutions, start-ups and entrepreneurs. According to the idea of technopark, all of these actors were expected to interact with each other and with state authorities and local government bodies in order to develop a modern technological and organisational environment for the purpose of innovative entrepreneurship and implementation of venture projects (see Figure 2.13).

[11] For example, 437 defense-industry enterprises were transferred to Rostec by 2009. The group's aggregate loss was RUB 630 billion. 30% of these enterprises were in pre-crisis or crisis situations (28 in the bankruptcy stage, 17 without economic activities, and 27 having lost or at risk of losing property). Vasilieva and Drankina, 2012, p. 35).

Figure 2.13. The technopark model in the high-tech sphere



Source: Developed by the author

The infrastructure facilities of technoparks were to be created using local and federal budget funds. The federal government allocated significant amounts to the regions for this purpose. This programme led to a sharp surge in the number of technoparks created from 2006 to 2009, most of which were built in close proximity to major scientific centres that encompassed universities.

Entrepreneurial support

The 2007 federal law "On the Development of Small and Medium-Sized Enterprises in the Russian Federation" had positive implications for the support offered to small, innovative enterprises (Goremykina, 2009). Such concepts as "medium-sized businesses", "microenterprises", "support infrastructure for small and medium-sized businesses", and "support measures for small and medium-sized businesses" were introduced (Schepot'ev and Safronova, 2008). The law determined the peculiarities of the regulation of small and medium-sized businesses in the Russian Federation, discussed the provision of financial incentives, and simplified related bureaucratic procedures.

In fact, this law established the rights and obligations of the participants in the newly created NIS in terms of the development and implementation of support programmes for small and medium-sized businesses. At the same time, it assigned a significant role to regional authorities in the formation and implementation of municipal programmes for the development of entrepreneurship. This role was designed to take national and local socio-economic, environmental, cultural and other characteristics into account, and was aimed at ensuring the formation of an innovation infrastructure that would effectively support small and medium-sized innovative businesses in the various regions.

The adoption of this law served as an impetus for the adoption of regional laws on the support and development of small and medium-sized businesses in 2008 and 2009. It also triggered the development of new, more complex and well-thought-out municipal programmes for the development of small and medium-sized businesses with a special focus on innovative entrepreneurship.

Support for R&D execution

In 2008, the federal programme "Scientific and scientific-pedagogical personnel of innovative Russia" for 2009-2013 was adopted and subsequently implemented. The programme aimed to address the loss of a generation of scientists as a result of the underfunding of science-related activities from the late 1980s to 2000. This underfunding led to young people losing interest in science, the departure of young scientists to other spheres of the economy, and the emigration of scientists who found it impossible to realise their creative and scientific potential in Russia.

To combat "brain drain", measures were implemented that allowed higher-education institutions and R&D organisations to invite former compatriots working abroad to lead research being undertaken by Russian scientific teams. These measures were designed to systematise the experiences of fellow citizens through certain activities. For example, qualified Russian scientists who had moved abroad in the post-Soviet period could be invited to hold scientific seminars for their colleagues in their homeland, where they could share their experience, knowledge and skills (Agranovich, 2007). This area of the programme also covered the mobility of scientific and scientific-pedagogical personnel within the country.

The programme included a combination of targeted, competitive financing of scientific research undertaken by scientific and higher-education institutions led by leading Russian scientists; and research conducted by young scientists and graduate students, including research led by reputable Russian scientists living abroad. Moreover, the programme provided for targeted financing of mobility, including financing of internships for young scientists, and participation in Russian and international scientific conferences, workshops, competitions and intellectual contests. A separate part of the programme was devoted to infrastructure projects aimed at financing the construction of dormitories for the students, post-graduate students, faculty and administrative staff of leading Russian universities in various regions. To create an opportunity for scientific investigation and discoveries, modern equipment was purchased to equip the research laboratories of the leading Russian universities. To attract a new generation of talented young people to science, scientific and

technical creativity centres for children and young people were developed. In addition, the results of intellectual competitions (Olympiads) were used as a basis for enrolment in higher-education institutions.

The launch of this federal programme received broad approval and support in the scientific and scientific-educational communities (Agranovich, 2007). It allowed for the testing of a new set of measures aimed at supporting scientific and scientific-pedagogical personnel, created a system of research grants, and started other projects to support the development of scientific and educational structures. As a result of the implemented measures, the steady decline in the number of personnel in the R&D sector had nearly come to an end by 2016 (see Figure 2.5).

However, several problems remained unresolved, such as the age-related imbalance among researchers (i.e., the dominance of older researchers), and the incomplete conformity of the qualifications of Russian scientific and scientific-pedagogical personnel with modern international demands. The latter also aggravated another situation: scientific personnel lacked the training necessary to use research equipment from abroad, which had been purchased using state funds. Therefore, scientists were unable to effectively utilise the capabilities of that modern research equipment. Overall, the lack of scientific and educational institutions capable of efficiently carrying out R&D slowed the formation of a professional environment supportive of young scientific and scientific-pedagogical personnel. This was the motivation for establishing national research universities that could offer best-practice examples for conducting high-quality research that could be integrated with education.

A federal target programme entitled "Research and development in priority areas of Russia's scientific and technological complex development for 2007-2013" was also adopted. The main objective of this programme was to build a system that would allow for the consolidation and concentration of resources in promising scientific and technological areas through the application of public-private cooperation mechanisms. In particular, this programme aimed to stimulate R&D orders from private businesses and innovative enterprises. This goal could not be achieved without the development of an effective NIS infrastructure.

Information and transparency

A significant achievement in this period was the adoption of a strategy for the development of the information society, which reflected the constitutional rights of Russian citizens to

access information. The strategy aimed to provide equal opportunities for information access and for obtaining basic communication services regardless of territory or region of residence. The objectives of the strategy were to develop the telecommunications infrastructure, improve the quality of education and medical services based on information and communication technologies, and introduce e-government. These activities were to be backed by the training of qualified personnel in this field.

Implications for innovation and networking

This period was devoted to the construction of a systemic approach and included developing the elements necessary for the NIS, creating a long-term vision of socio-economic development in which innovation was the driving force, determining the role of the state in the country's innovative development and solving the issues arising from previous stages of development in terms of imperfect framework conditions. In this period, such processes as the creation of systemically important organisations tasked with developing innovation system, like the Russian Venture Company (RVC), were initiated. RVC's key task was to stimulate the venture-capital market's development as a basic mechanism through which private capital could flow into the innovation sphere. The regulatory framework was improved in the areas of intellectual property protection, market competition and anti-corruption. Moreover, initial steps were taken to create economic incentives for innovation and systematic efforts were initiated to stimulate demand for innovation. These efforts included the launching of state corporations, which were tasked with modernising production on the basis of innovative solutions. A great deal of attention was paid to understanding the infrastructure necessary for successful commercialisation, which led to a number of laws and the initiation of a federal programme to establish technoparks in the high-tech sphere. Thus, steps were taken to develop the innovation system in the higher layers of the innovation pyramid (see Figure 1.18) from the point of view of improving the framework conditions and building the infrastructure.

In terms of constructing a common vision of the priorities in the development of the Russian NIS, assumptions were made based on Russia's historically important technology sectors (e.g., aircraft engineering, space exploration, nuclear energy). In particular, Russia was expected to be able to produce innovative products that would be in demand on the global market, which was viewed as a single market based on the division of competences and labour among countries, and free trade. At the same time, additional areas of technological development were identified. For example, nanotechnology was seen as a

new area in which Russia could make a breakthrough and become a world-leading market player, as it had been in space exploration and nuclear energy.

With regard to establishing links among the knowledge-generation, knowledge-application and knowledge-explotation subsystems, a system of technology parks was introduced to enable these links to be effectively established and prosper. However, entrepreneurial motives among the population, and the corresponding skills and systems that can give rise to the emergence of technology entrepreneurs were absent. In other words, the key aspect of where to find innovative companies ready to become residents of technoparks and develop their technological solutions was not considered. The stimulation of the emergence of SMEs with a special focus on innovative entrepreneurship was categorised as a task that was to be solved at the regional level. Entrepreneurship in Russia as a whole lacked an innovative nature, as it generally aimed at producing goods and services that were in demand on local markets. The technoparks stood relatively empty because of the absence of a sufficient number of companies in need of the technopark environment.

This approach, which was based on stimulating the development of science in the prioritised areas and creating an environment conducive for the commercialisation of scientific developments (technology-push approach), did not lead to a boom of new innovative companies. In fact, few people wished to engage in difficult and risky technological entrepreneurship in the absence of relevant skills. Moreover, they lacked an understanding of which resources were needed or where to find them. The belief that the required resources could not be obtained without informal *blat*-based relations was widespread. Thus, many felt that no one could build a successful business starting from an innovative idea or technology alone. This illustrates Smallbone and Welter's (2012, p. 219) idea that "whilst changes in formal institutions create opportunity fields for entrepreneurship, informal institutions influence the collective and individual perception of entrepreneurial opportunities. In situations where formal and informal rules conflict, previous experience and tacit knowledge are the main influences on entrepreneurial behaviour".

In light of this inertia, the institutional system had to react and take appropriate actions. More specifically, actions were required to achieve a significant paradigm shift in Russian society's cognitive frameworks related to the importance of innovation, the role of technological entrepreneurship in this process, and the view of this sphere of activity as prestigious and economically viable for self-realisation.

Consequently, without appropriate psychological and economic motives related to the perception of innovation as a prerequisite for the discovery and use of market opportunities, and without mechanisms to support actors' interaction in the NIS, public financial injections into innovation systems could not lead to an increase in output. The same was true for state directives indicating that businesses should be more innovative. Notably, the goals set out in the Strategy for the Development of Science and Innovation for the period until 2015 were not achieved by the interim control year of 2010 or by 2015 (see Table 2.14).

Table 2.14. Strategy for the Development of Science and Innovation, targets and achievements

<table>
<tr><td></td><td colspan="2">By 2010-2011</td><td colspan="3">By 2015-2016</td></tr>
<tr><td colspan="6">Input</td></tr>
<tr><td>Steady growth in R&D expenditures</td><td colspan="2">Target: 2% of GDP in 2010
Actually achieved: 1.13%</td><td colspan="3">Target: 2.5% of GDP in 2015
Actually achieved: 1.1%</td></tr>
<tr><td>Increased share of non-state funds in R&D expenditures</td><td colspan="2">Target: 60% in 2010
Actually achieved: 54.6%</td><td colspan="3">Target: 70% in 2015
Actually achieved: 52%</td></tr>
<tr><td>Increased influx of young people into the scientific sphere (i.e., the proportion of researchers under the age of 39)</td><td colspan="2">–
Actually achieved: 35.5%</td><td colspan="3">Target: 36% in 2016
Actually achieved: 42.9%</td></tr>
<tr><td rowspan="4">Growth in Russian companies’ own R&D expenditures</td><td colspan="5">Target: Growth of at least 10% per year</td></tr>
<tr><td colspan="5">Actually achieved:</td></tr>
<tr><td>2011</td><td>2012</td><td>2013</td><td>2014</td><td>2015</td></tr>
<tr><td>83%</td><td>23%</td><td>23%</td><td>9%</td><td>-1%</td></tr>
<tr><td colspan="6">Output</td></tr>
<tr><td>Coefficient of patent activity</td><td colspan="2">Target: 4.0
Actually achieved: 3.8</td><td colspan="3">Target: 5.5
Actually achieved: 4.32</td></tr>
<tr><td>Share of enterprises that carry out technological innovations relative to total number of enterprises</td><td colspan="2">Target: 15%
Actually achieved: 7.9%</td><td colspan="3">Target: 20%
Actually achieved: 8.3%</td></tr>
<tr><td>Share of innovative products relative to total sales of industrial products</td><td colspan="2">Target: 15%
Actually achieved: 4.89%</td><td colspan="3">Target: 18%
Actually achieved: 7.95%</td></tr>
</table>

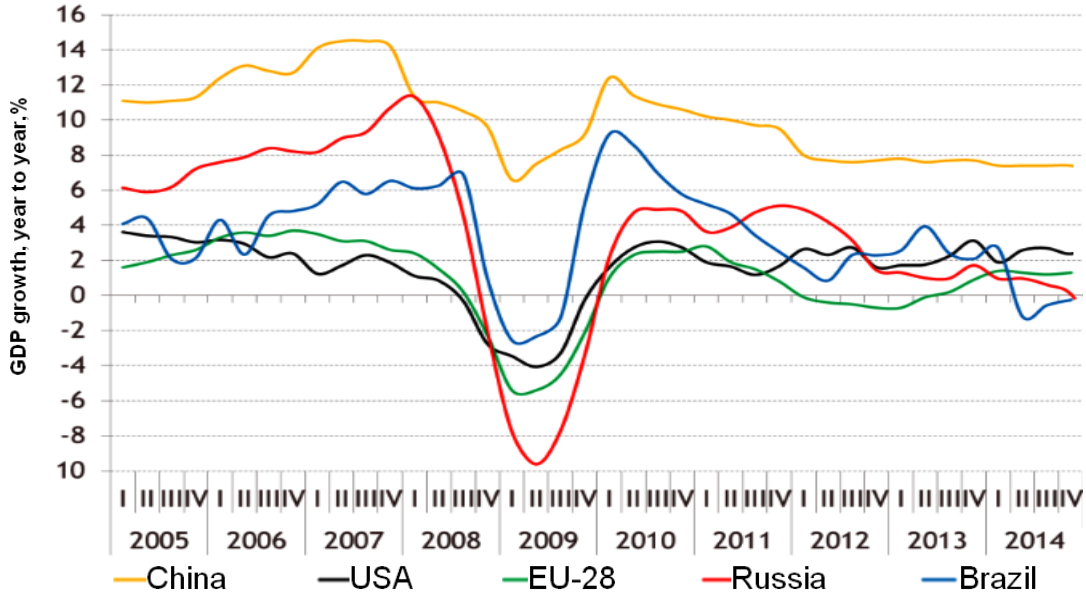
Source for achievement data: Rosstat 2016

Thus, this discussion indicates that in the Russian context it is relevant to discuss the role of networking (as defined in Section 1.2) in the development of innovations among companies that emerged before 2009. At that time, there was no NIS infrastructure within which networking could take place and people had little motivation to establish innovation-based companies, which would require networking.

Phase 4: 2009 – 2013

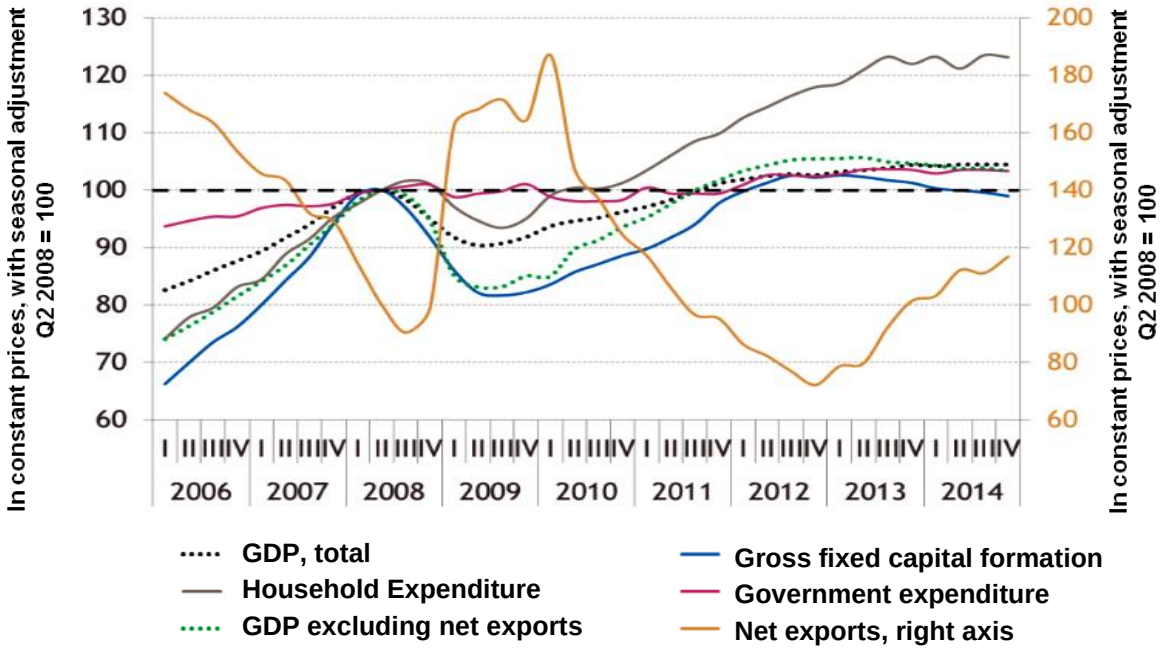
The 2008-2009 crisis clearly showed that Russia had to reconsider its approach to social and economic development. The depth of the world recession (see Figure 2.14) was aggravated by the Russian economy's dependence on global raw-material prices (see Figure 2.15). The subsequent slowdown in growth rates in the post-crisis period confirmed the inefficiency of the growth model typical for Russia in the 2000s and the gradual exhaustion of its capabilities. The need for a new economic strategy was dictated by the challenges in the external environment and by internal demands for social change.

Figure 2.14. Quarterly GDP dynamics of the world leading countries (annual data), 2005-2015



Source: ACGRF, 2015

Figure 2.15. Dynamics of Russia's GDP, 2006-2014



Source: ACGRF, 2015

In May 2009, the “National Security Strategy of the Russian Federation through 2020” was adopted. Of the key global-development trends, the Strategy named globalisation in all spheres of international activity, high dynamism and the interdependence of events. It also pointed to the intensification of the contradictions associated with uneven development as a result of globalisation and the deepening of the welfare gap between different countries. The Strategy declared that, in general, Russia overcame the consequences of the systemic political and social and economic crisis of the late twentieth century – stopped the decline in the quality of life of Russian citizens; resisted the pressures of nationalism, separatism and international terrorism; prevented the discrediting of the constitutional order; preserved sovereignty and territorial integrity; and restored the opportunities to increase its competitiveness and sustain national interests as a key actor in emerging, multipolar international relations.

At the same time, the Strategy noted that the slow pace of the national economy’s transformation toward innovative development impeded the successful integration of Russia with the global economic space and the corresponding system of an international division of labour. The strategy named several priorities related to ensuring sustainable development and national security. This list included economic growth, which was to be primarily achieved through the development of a national innovation system and investments in human capital. In general, science, technology, education, health and culture were to be developed by strengthening the role of the state and improving public-private partnerships.

In September 2009, within the framework of the preparation of the Presidential Address to the Federal Assembly, President Medvedev published an article entitled “Russia, strive forward!” for general discussion in the *Gazeta* online edition (Medvedev, 2009a). In that article, he outlined his views on Russia's development problems and the priority areas for technological modernization. The article, which was written in a journalistic style, represented a call for cooperation and consolidation of effort among all who shared the President’s views on the possibility of building an innovative Russia. This article sparked a heated discussion in the press, as the creation of a space for open discussion of the problems associated with Russia’s development was an unusual step for the Russian government. The article was also called a “programme document”, as its postulates later led to concrete steps that affected the development of the national innovation system.

Medvedev noted that it would be inappropriate to attribute the difficulties that had arisen in Russia’s economic transition solely to the country’s "poor inheritance", as manifested in

the form of economic backwardness, age-old corruption, the "semi-Soviet" social sphere, a fragile democracy, negative demographic trends and political problems in the Caucasus. In his opinion, the key problem was not natural path dependency but "an old Russian habit of relying on the state's problem-solving abilities, foreign countries' assistance, powerful doctrines – on anything or anyone except ourselves" (Medvedev, 2009a). The article explicitly declared the need to change the mentality and take an active role in building the future: "It is not the commodity exchanges that must decide the destiny of Russia, but our own perception of ourselves, our history, future, our intellectual abilities, our strength, our self-esteem and our entrepreneurial power". The goal of building an innovative economy to secure Russia's future prosperity was identified as a new, unifying idea capable of rallying people and consolidating their efforts:

> We will encourage and stimulate scientific and technical creativity. First of all, we will support young scientists and inventors. Secondary schools and higher-education institutions will prepare a sufficient number of specialists for promising industries. Scientific institutions will concentrate their main efforts on the implementation of breakthrough projects. Legislators will make decisions that support the spirit of innovation in all spheres of public life, and create a market of ideas, inventions, discoveries and new technologies. Public and private companies will receive full support in all of their endeavours to create demand for innovative products. Foreign companies and scientific organisations will be provided with the most favourable conditions for the construction of research and development centres in Russia. We will invite the best scientists and engineers from around the world to work here. Most importantly, we will explain to our young people that the most important competitive advantages are knowledge that others do not have, intellectual superiority and the ability to create the things people need. The inventors, innovators, scientists, teachers or entrepreneurs who introduce new technologies will become the most respected people in society. They will receive from society everything necessary for fruitful activity. (Medvedev, 2009a)

This article identified potential areas in which Russia could form its competitive advantage (e.g., new types of fuel; technical solutions for energy transportation; medical equipment, including ultra-modern diagnostic tools; and medicines for the treatment of viral, cardiovascular, oncological and neurological diseases). It also named technologies that should be developed as a basis for future competitive advantages: nuclear technologies, information technologies, global public-information networks based on supercomputers, and terrestrial and space infrastructure for the transmission of all kinds of information. Remarkably, this article was the first to name not only promising technologies but also markets in which innovations could be commercialised as development horizons.

Governance

In the annual Presidential Address to the Federal Assembly (12 November 2009), Medvedev indicated his refusal to force the growth of the old, raw-material-dependent economy. He noted that individual, non-systemic decisions in the field of innovation policy would not allow for formation of a new "smart economy that produces unique knowledge, new technologies and things useful to people" (Medvedev, 2009b). He also stated that the technological modernisation of the entire production sector was a matter of Russia's survival in the modern world. Therefore, the political course did not aim to improve the inherited, disparate blocks of the national innovation system (i.e., the principle of "patching holes") but to build a new system "based on values and institutions of democracy", taking available resources and international experiences with building national innovation systems into account.

Medvedev also highlighted the need to create a new powerful R&D centre built on completely new principles. The centre was to focus on supporting *all* priority areas of science and technology development, and thereby achieve synergies in R&D. In his Address, he compared this technology centre with Silicon Valley. This new project was expected to be a flagship that demonstrated to stakeholders inside and outside of Russia that the country had broken free of the shackles of its heritage. The project was tasked to demonstrate that Russia was not only ready to form a new, local infrastructure that was attractive for the work of leading scientists, engineers, designers, programmers, managers and financiers from around the world, but it could also show results in the form of new competitive technologies and products that would be in demand on the global market (Rashidov, 2012).

An example demonstrating that innovations could be successfully commercialised was desperately needed. Despite the efforts to build an innovative system, the skeleton of which already existed, a boom in innovative development did not emerge. Some of the existing elements were deficient. For example, most of the Russian university technoparks did not meet the standards of their foreign counterparts (Shukshunov, 2009), and some only existed on paper even though federal funds had been allocated for their construction in 2006-2009 and had been spent (Pavlov, 2013). The high-tech technopark model, which was designed to generate a large number of innovative, high-tech start-ups, was incoherent in principle, as most emerging companies had no future given the absence of demand for innovative products from consumers and business markets. At the same time, the developing venture industry found very few start-ups worthy of and ready for venture

financing. Moreover, there were no mechanisms to ensure a return on investment, as large corporations were not innovative and did not want to be strategic investors, IPO platforms in Russia were still underdeveloped, and venture capitalists had no success stories to which they could look for motivation (Yakovenko, 2012). In the absence of the processes that were necessary complement to the innovation system's structural elements, the number of innovative enterprises remained low, the volume of innovative products stagnated, and the venture market could not develop effectively, as the NIS actors could not efficiently engage in joint projects or set common goals (Etzkowitz and Ranga, 2013).

In January 2010, a group of top Russian officials, led by First Deputy Prime Minister Igor Shuvalov and Deputy Head of the Presidential Administration Vladislav Surkov, visited the Massachusetts Institute of Technology (MIT) to study that institution's success with merging business and science with the goal of commercialisation. The group wished to understand the NIS infrastructural elements that should be brought together to create organisational innovation; how those elements should function, including the key actors that were needed; how the elements should interact; and the role the government should play to ensure that results could be obtained (Rashidov 2012). In June 2010, President Medvedev went to MIT on an official visit, during which a framework agreement was signed between MIT and the Skolkovo Foundation to create a new innovation centre. Given the budding relations with American consultants, Etzkowitz's Triple Helix concept (Etzkowitz, 2008), which emphasised venture-capital mechanisms as the engine of national innovation systems, was adopted as the main methodological basis for building Russia's NIS in this period (Dezhina and Kiseleva, 2008).

On September 28, 2010, Federal Law No. 244-FZ on "The Skolkovo Innovation Centre" was signed. The goal was to create an enabling environment for international intellectual capital capable of generating innovations. Skolkovo was expected to eventually become one of the most recognised and respected Russian brands associated with innovation.

Initially, the project was to be implemented on the basis of crowd funding. However, motivated by the need to involve not only the state but also Russian business in the implementation of such multi-scale projects, Medvedev suggested that Viktor Vekselberg, a manager – the Head of the Renova Group of Companies – but not a government official, should lead the Russian part of the project-coordinating structure. The Skolkovo project exemplifies the state's coercion of Russian oligarchs to contribute to the construction and creation of a new "Silicon Valley" designed to provide Russia's innovative breakthrough (Rashidov 2012).

As Russia's first science city, constructed from scratch in the post-Soviet period, Skolkovo was expected to create special economic conditions for companies operating in the prioritised sectors during Russia's economic modernisation: energy efficiency and energy savings, including the development of innovative energy technologies; nuclear technologies; space technologies, especially in the field of telecommunications and navigation systems (including the creation of appropriate infrastructure on the ground); medical technologies in the fields of equipment and medicines; strategic computer technologies and software; and biotechnology in agriculture and industry.

The development of the NIS was so rapid from 2009 to 2013 that it is impossible to list all of the measures implemented. The key categories of measures and examples are presented in Table 2.15 (see also Appendix 2.1):

Table 2.15. Measures for the development of the NIS, 2009-2013

Strengthening the innovation system's resource base	▪ Significant increase in targeted financing of university science, including mega-grants for prospective studies, which also allow foreign scientists to participate. ▪ Establishment of national research centres. ▪ Provision of financial support to higher-education institutions and the state's scientific organisations for the implementation of complex projects to create high-tech production (corresponds with the implementation of the entrepreneurial university concept (Etzkowitz et al., 2008). ▪ Creation of new institutes for NIS development: Internet Initiatives Development Fund; the Development Fund for the Centre for Development and Commercialisation of New Technologies (SKOLKOVO), the Agency for Strategic Initiatives (ASI), the VEB-Innovation Fund, the Foundation for Infrastructure and Educational Programs of RUSNANO. ▪ Increase in the number of educational projects in the innovative entrepreneurship field through state institutions and private initiatives (e.g., Digital October, Greenfield Project). ▪ Increase in the number of business incubators and accelerators in higher-education institutions, venture funds and separate private ventures.
Improving the framework conditions	▪ Development and early implementation of roadmaps for the National Entrepreneurship Initiative under the management of ASI. The roadmaps include measures aimed at reducing administrative barriers in the economy and improving the investment climate in Russia. ▪ State scientific and educational institutions are given the right to create small innovative enterprises and commercialise their R&D results. ▪ Development of various forms of venture and loan financing for innovative activities, including angel funding, and pre-seed and seed financing for start-ups. ▪ Introduction of a system of tax benefits with a view to supporting small and medium-sized enterprises, as well as scientific, technical and innovative activities. ▪ Creation of the Innovative and Investment Market on the Moscow Exchange and launch of the MICEX Innovation Index. ▪ Development of a network of high-tech (built around educational and scientific institutions) and industrial (built around a focal industrial complex) technoparks. ▪ Development of comprehensive programmes to support innovative

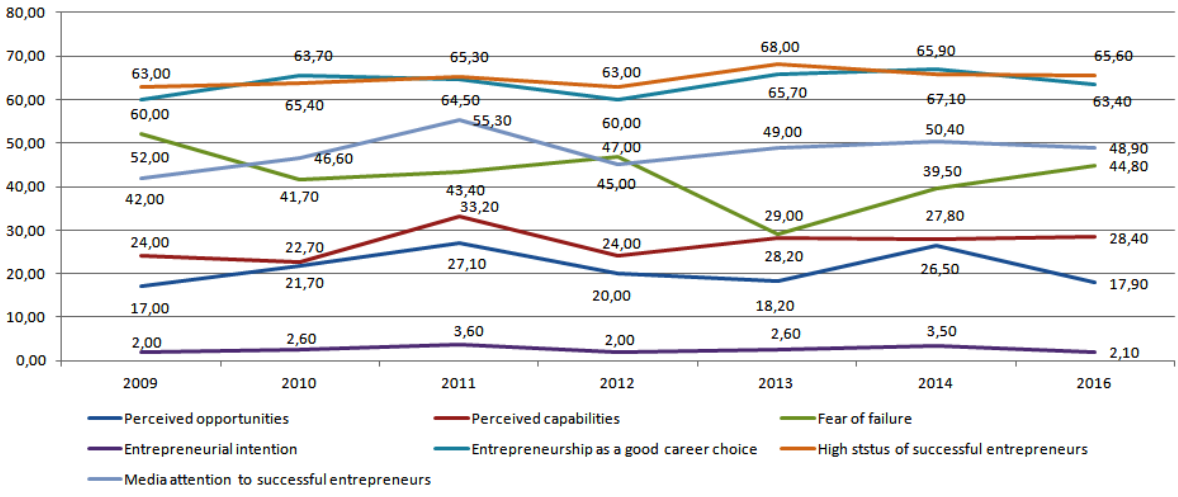
	entrepreneurship in the regions. ▪ Continued reform of the higher-education system with regard to the transition to a competent approach in education and the stimulation of new, "entrepreneurial" higher-education and scientific institutions. ▪ Reform of the Academy of Sciences. ▪ Development of technopark standards with a methodological framework for performance evaluation and launch of technopark certification. ▪ Development of professional standards, including a wide range of specialties. ▪ Development and launch of tools for ensuring the openness of the information space, including the open government system.
Stimulating demand for innovative products	▪ Introducing a complex programme of state support for the development of cooperation among industrial organisations, higher-education institutions and scientific institutions aimed at implementing comprehensive projects for the creation of high-tech production. ▪ Improvements in the public-procurement system, which provides an opportunity for small and medium-sized businesses to participate. ▪ Creation of the Foundation for Advanced Studies (Russian equivalent of DARPA), a programme for the modernization and development of the defence industrial complex based on innovative technological solutions. ▪ At the request of the government, state corporations and companies with state participation begin to develop innovation-development programs.
Aligning interactions among NIS participants	▪ Introduction of technology platforms – communication instruments aimed at pooling the efforts of all NIS stakeholders to intensify scientific, technological and innovative development. ▪ Launch of "Innopraktika" – a platform for consolidating the efforts of applied, fundamental and university science to solve the most urgent problems of enterprise development. ▪ Launch of the online information and communication platform Leader ID with the objectives of involving civil society in innovation activities and consolidating human resources for the implementation of innovative projects. ▪ Introduction of national competitions for start-ups with the aim of integrating start-ups into the innovation community in order to establish the necessary links. Competitions include the National Prize for Innovation "Zvorykin Prize" (from 2009 to 2013) and GenerationS (since 2013). ▪ Establishment of regional competitions for start-ups, which are organised by local governments with the participation of regional venture funds. ▪ Introduction of the international forum "Open Innovations" in 2012. ▪ A large number of open conferences and networking events for start-ups, venture business, mentors, consultants and other experts in the field of innovation.
Introducing new organisations to manage innovation activities	▪ Creation of new structures outside the federal government to take part in developing strategies and creating policy documents, selecting and developing personnel, coordinating the implementation of individual projects and evaluating their effectiveness: the Agency for Strategic Initiatives, the Association of Innovative Regions of Russia, the Association of Industrial Parks, the Association of High-Tech Technoparks, the Club of Directors for Science and Innovation and others. ▪ Implementation of a nationwide programme to find and attract young leaders to the NIS projects on a competitive basis (supported by ASI).

Source: Developed by the author

For the first time, the themes of technological innovations and innovative entrepreneurship were purposefully popularised. National prizes were created for entrepreneurs and innovative companies (e.g., "Business Success" for individual entrepreneurs and "Tech Success" for tech companies), stories of start-ups' success were extensively covered in the press, and the Skolkovo project and "Open Innovations" activities were widely discussed. Numerous state-supported and private projects aimed to familiarise civil society with successful Russian and foreign experiences in innovative entrepreneurship started. Successful foreign entrepreneurs and business gurus visited Russia, and foreign tours were organised for representatives of Russian start-ups interested in studying best practices. Major roles in the implementation of these activities were played by the Russian Venture Company (RVC) and, later, by ASI, which were the key organisers of most projects sometimes in partnership with private actors.

These activities led to positive dynamics in entrepreneurial attitudes and strengthened the status of entrepreneurs (see the Figure 2.16). However, these efforts failed to break the established trend: no more than 4% of respondents indicated an entrepreneurial intention in 2011. This was still lower than in most other countries (OECD, 2015).

Figure 2.16. Entrepreneurial behaviour and attitudes, 2009-2014



Source: GEM Global Reports 2009-2016, http://www.gemconsortium.org/report

The efforts to encourage state companies to innovate through the creation and implementation of special innovation-development programmes led to clear results in this period. The share of state-owned companies' extra-budgetary funds used for domestic R&D increased from 1.59% of sales in 2010 to 2.02% in 2015, on average (Gokhberg, Kuznetsova, 2015). The share of innovative products to total sales in state-owned companies rose from 15.4% to 27.1%, respectively. Exports of innovative products also

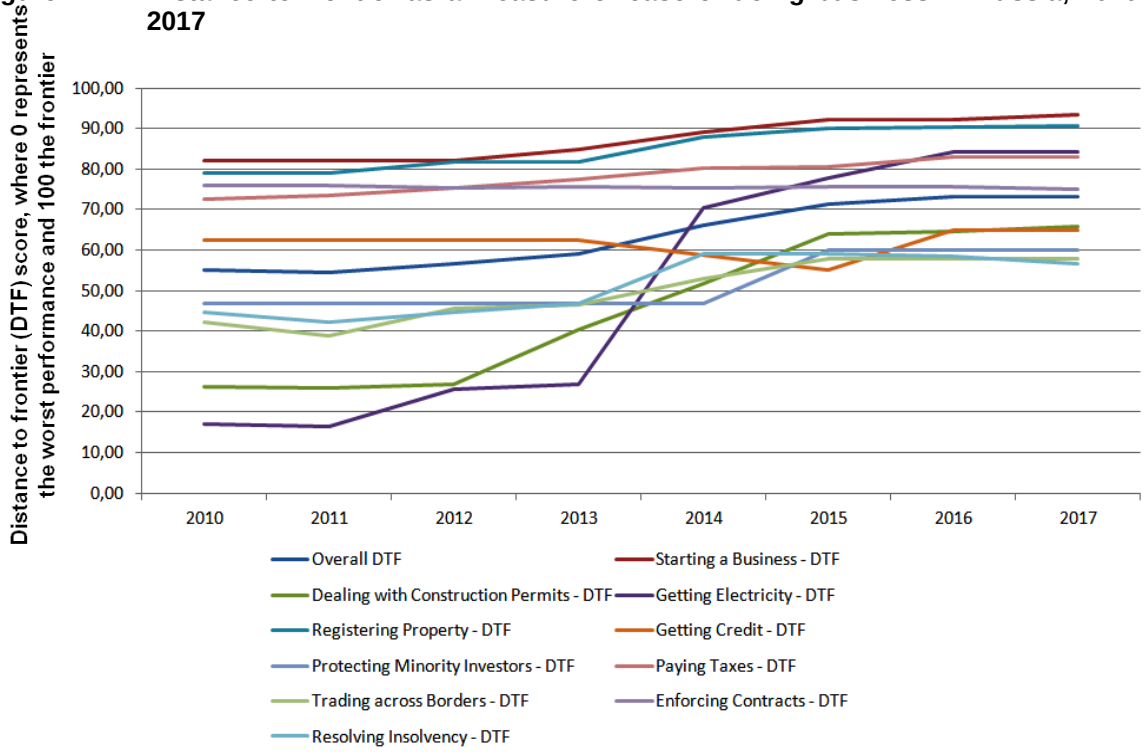
increased, especially in the aircraft, shipbuilding and chemicals industries (Gokhberg, Kuznetsova, 2015).

In 2011, owing to a decision made by Vladimir Putin, a group of experts including leading Russian and foreign specialists, and representatives of scientific institutions, universities, development and business institutions participated in the preparation of recommendations for the country's social and economic development. These recommendations formed the foundation for the development of the Strategy for Innovative Development of the Russian Federation for the period until 2020, which became the electoral platform used by presidential candidate Vladimir Putin.

Entrepreneurial support

The implementation of a set of measures to support entrepreneurship at the regional and federal levels, including the activities of the National Entrepreneurship Initiative, made it possible to achieve some success in terms of improving opportunities for entrepreneurial activity. This was particularly true with respect to such indicators as ease of opening a business, getting access to electricity, registering property and paying taxes (see Figure 2.17).

Figure 2.17. Distance to frontier as a measure of ease of doing business in Russia, 2010-2017



Source: Doing Business indices, the World Bank Group 2010-2017, http://www.doingbusiness.org/rankings

In addition, the numerous professional-development programmes in the field of management and entrepreneurship that were organised by development institutions, higher-education organisations and private providers, and the popularisation of entrepreneurship in the mass media helped more people feel that they had the capabilities necessary to become entrepreneurs (see Figure 2.16, GEM). All of these developments led to a 27% increase in the number of small and medium-sized small enterprises (see Table 2.16).

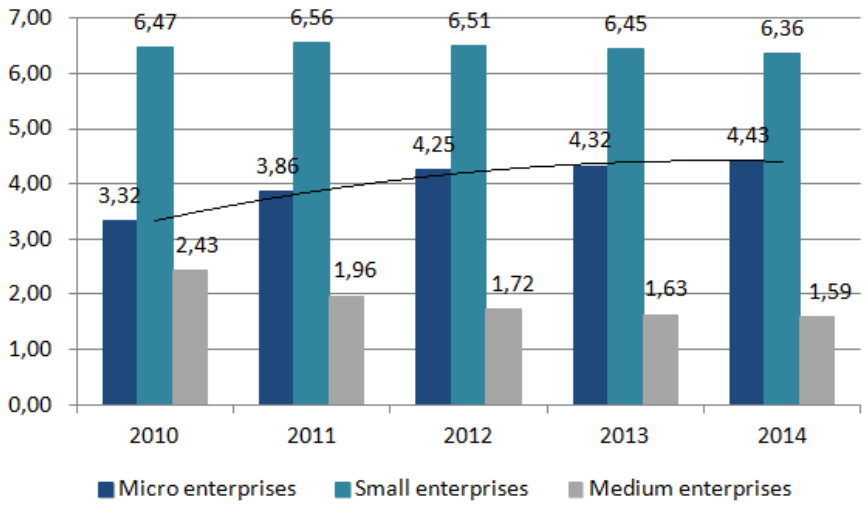
Table 2.16. Indicators for small and medium-sized enterprises in Russia, 2010-2014

	2010	2011	2012	2013	2014
Number of enterprises, end of the year, thousands	1,669.5	1,852.3	2,016.8	2,076.8	2,117.5
Average number of SME employees, thousands.	12,216.9	12,386.3	12,475.2	12,405.9	12,375.3
Employment, percentage of total business	26.2%	27.0%	27.1%	27.1%	27.1%
Sales, percentage of total business	28.5%	27.3%	26.5%	25.4%	25.0%
Fixed capital investments, percentage of total businesses	9.5%	6.3%	5.8%	6.6%	7.0%
Fixed assets, percentage of total business	23.5%	21.9%	21.5%	21.7%	18.2%

Source: Rosstat, 2015

In the micro-enterprise category, which includes start-ups, the number of organisations increased by 32% from 2010 to 2014 and the average number of employees per organisation grew by 33% (see Figure 2.18). Therefore, in general, state policies aimed at stimulating the emergence of start-ups appear to have been successful.

Figure 2.18. Growth in average number of employees, by SME category at the end of the year, in millions

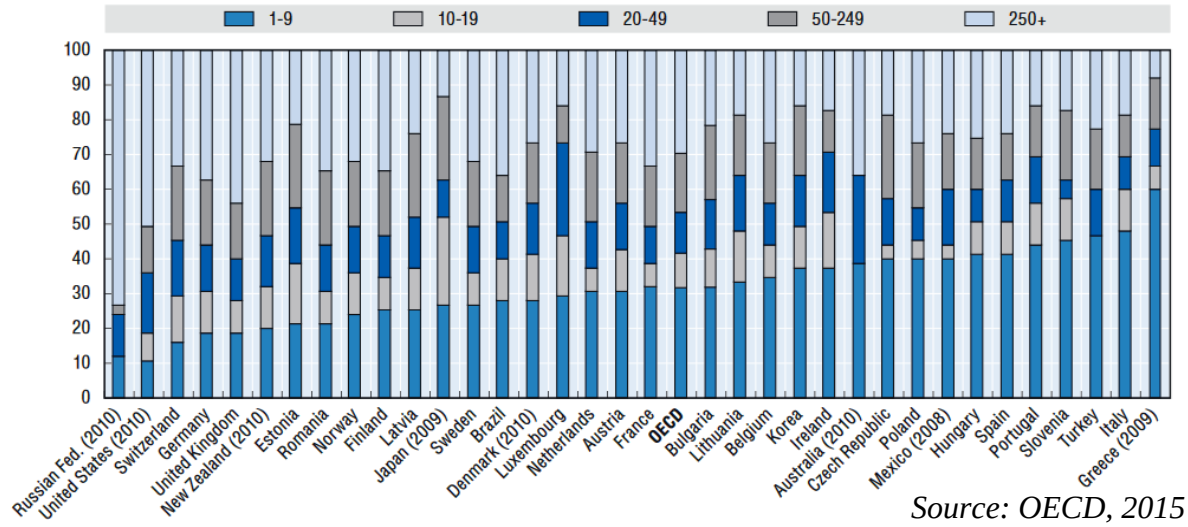


Source: Rosstat, 2015

Nevertheless, on the whole, the contribution of Russian small and medium-sized businesses to the Russian economy remained insignificant. National statistics indicate that Russian SMEs accounted for less than 30% of enterprise sales from 2010 to 2014, and this

share decreased – it fell from 28.5% in 2010 to 25% in 2014. In addition, national statistics indicated that SMEs accounted for less than 10% of the total fixed-capital investments of businesses and, on average, 20% of the fixed assets of all enterprises, as most small businesses operated on leased premises (see Table 2.16). While not strictly comparable with international data because of differences in the methodology for determining enterprise size,[12] these proportions are well below the figures seen in OECD countries. In these countries, around two-thirds of business value added is generated by SMEs and approximately 70% of the population are employed by these enterprises (see Figure 2.19) (OECD, 2015).

Figure 2.19. Share of employment by enterprise size class, percentages, 2011 or latest available year



Source: OECD, 2015

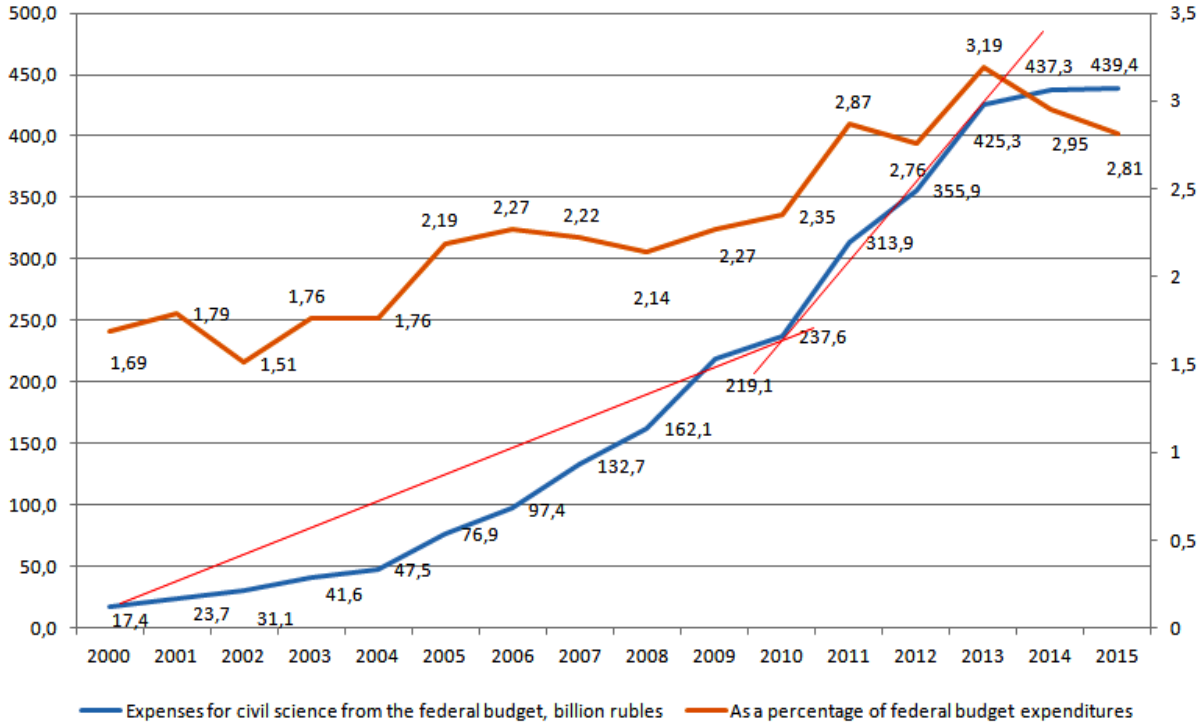
The transition to an entrepreneurial economy was perceived as desirable in the long run to achieve economic diversification and stabilisation. However, taking into account not very significant proportion of value added generated by SMEs in the Russian economy, and the objective difficulties in ensuring the rapid growth of SMEs' number, there could be no breakthrough in the building of an innovative economy in the short run without systemic steps towards improving large companies' innovativeness.

Support for R&D execution

The significant dependence of civil science and education on state funding did not allow for their independent, integrated development within the framework of Russia's existing economic structure. To achieve a critical mass of R&D actors, academic research and education resources, it was not only necessary to increase the amount of funding (see Figure 2.20) but also to improve the efficiency with which those funds were used.

[12] In Russia, the classification of SMEs is carried out on the basis of annual revenue from the sale of goods (works, services), excluding value-added tax, established as follows: micro enterprises - 60 million rubles; small enterprises - 400 million rubles; medium enterprises - 1000 million rubles.

Figure 2.20. Financing of the civil R&D sector from the federal budget



Source: Rosstat, 2016

Many measures were introduced to ensure the existence of the skills needed for the country's innovative development, including significant improvements in the efficiency of the education system. The federal programme "Scientific and scientific-pedagogical personnel of innovative Russia" for 2009-2013 was implemented. Moreover, compared with previous years, the government's competitive research funding for leading federal and national research universities was expanded (Gokhberg and Kuznetsova, 2016). In order to improve the professionalism of Russian specialists, and to stimulate the inflow of young, promising scientists and enable institutions to retain them, a scheme was introduced to foster academic mobility. Scientists and engineers were widely encouraged to undertake training in Russia and abroad, and to participate in international conferences.

A key measure aimed at restoring Russian science and stimulate scientific development in this period was the allocation of government grants for research in public Russian higher-education or research organisations. Public research institutions and universities received grants to commercialise new technologies and create innovative start-ups in accordance with the concept of "entrepreneurial university" (Etzkowitz et al., 2008). They could also obtain grants to enable them to invite top Russian and foreign professionals to work at their institutions (Gokhberg and Kuznetsova, 2016).

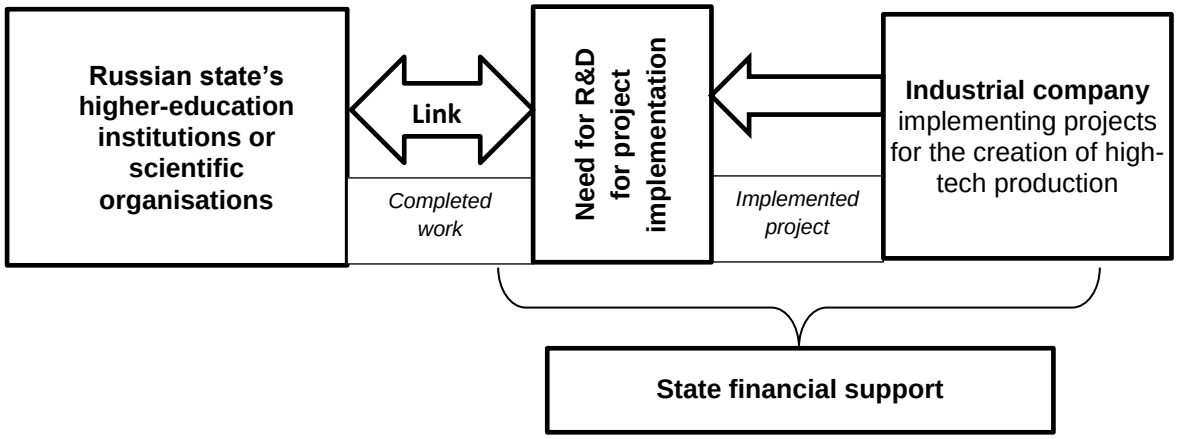
In 2010, the programme for the provision of mega-grants began. The plan was to allocate RUB 12 billion in mega-grants from 2009 to 2013. As a result of an open competition

conducted with the participation of foreign scientific arbitrators, 40 government grants, each amounting to up to RUB 150 million (USD 5 million), were allocated for conducting scientific research under the guidance of leading scientists in 2010-2013. In certain cases, these grants could be extended for two years. Any topic with a significant scientific perspective for development was accepted for consideration. Winners had to conduct scientific work in a Russian higher-education institution or public scientific centre that was not his or her own. Moreover, that institution had to have a new laboratory outfitted with the most modern research equipment. The goal was to revive science by attracting the most promising topics for development in Russia, creating new centres for research and producing cadres for the Russian scientific corps. Of the 40 winners of the first contest, only five were permanently residing in Russia. This was undoubtedly the programme's main success – bringing home the Russian scientific elite and attracting the best foreign scientists (Rudenko, 2011).

From 2010 to 2014, 160 laboratories were established in 27 scientific fields by 79 Russian universities and scientific organisations. Among the leading scientists invited to work in Russia were three Nobel laureates and a Fields Medal winner. From 2010 to 2013, members of the scientific teams of the newly created laboratories published more than 1,800 articles in scientific publications indexed in the Web of Science database and registered more than 500 items as intellectual property (Mega-grants, 2015). According to Stanislav Smirnov, a Fields Prize winner, in addition to the fact that receiving a mega-grant was very prestigious, the grants helped their recipients do something new, such as establish a new research group and move research in a new direction. In his opinion, the Russian mega-grants became an international brand (Komarova, 2016).

According to the expert community (Andrushchak et al., 2018), the 2010 government decree "On measures of state support for the development of co-operation of Russian state higher-education institutions and scientific institutions and organisations implementing comprehensive projects for the creation of high-tech production" had a significant impact on the development of relations among the knowledge-generation, knowledge-application and knowledge-exploitation subsystems in the Russian NIS. The decree envisaged the allocation of state subsidies to industrial companies to reimburse them for the costs of implementing the R&D work performed by the Russian state's higher-education institutions or scientific organisations if the companies co-financed the projects (see Figure 2.21).

Figure 2.21. State subsidies for cooperation between industrial companies and the Russian state's higher-education institutions/scientific organisations



Source: Developed by the author

Subsidies were allocated on a competitive basis. Therefore, in reality, a significant number of companies, universities and scientific organisations formed linkages with the aim of undertaking R&D and commercialising the results.

Russia's education system also underwent a significant transformation in the focal period. The 2012 Federal Law on Education in the Russian Federation established a framework for a modern education system that was consistent with international requirements. It fostered developments in educational programmes, including requirements for modernizing teaching methods, approaches and technologies. It raised the standards for PhD qualifications, and the PhD level officially became the third stage of higher education. This necessitated the development of an appropriate educational programme, including not only the writing of a dissertation but also the study of disciplines aimed at forming systematic research competencies. PhD students were also required to undertake pedagogical training, take on internships, and prepare and publish scientific articles. Moreover, in fulfilment of the law, higher education moved to the third-generation educational standards in 2010. Those standards were aimed at the formation of competences rather than providing knowledge on a given set of topics. Entrepreneurial competencies were included in the educational standards. Also, in accordance with the law, the secondary-school and professional-education systems were transformed. These changes included giving schoolchildren the opportunity to choose a specialisation in the last two years of their studies.

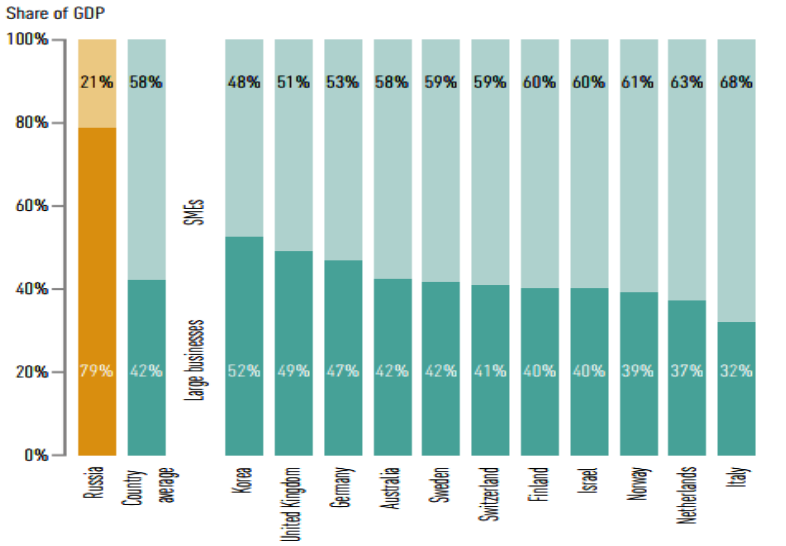
Under the leadership of the non-profit National Training Foundation, the Presidential Programme for Advanced Training of Engineering Personnel was implemented in 2012. The goals were to improve the qualifications of engineers in Russia's strategic industries, to develop engineering education by organising training programmes in prioritised

industrial sectors (e.g., energy and resource efficiency, nuclear technologies, space, medicine, ICT), and by offering internships in leading research and engineering centres in Russia and abroad[13]. The programme was based on private-state partnerships, and the interaction of educational institutions, business and government. Over the course of three years, RUB 655.5 million in state subsidies was allocated to finance the program's activities, while RUB 494.2 million was raised from the private sector. A database of the 544 programmes available to engineering personnel was developed and made publicly available on the programme's website.[14] The website also enabled enterprises to search for and order programs for specific tasks. This project allowed for the development of long-term partnerships between educational organisations and enterprises. Within the programme's framework, 16,594 specialists were provided with advanced training, of which 5,252 completed internships with Russian enterprises and engineering centres. Another 2,087 undertook internships abroad. Foreign internships were organised in 35 countries. In total, 96 educational organisations and 1,361 enterprises took part in the programme[15].

Commercialisation infrastructure

Given the significant contribution of large, often state-owned enterprises to the economy (see Figure 2.22 and Figure 2.23), the development of an innovative economy was not possible without activation of their innovative activities.

Figure 2.22. Contribution of small, medium and large business to GDP, Russia and developed countries

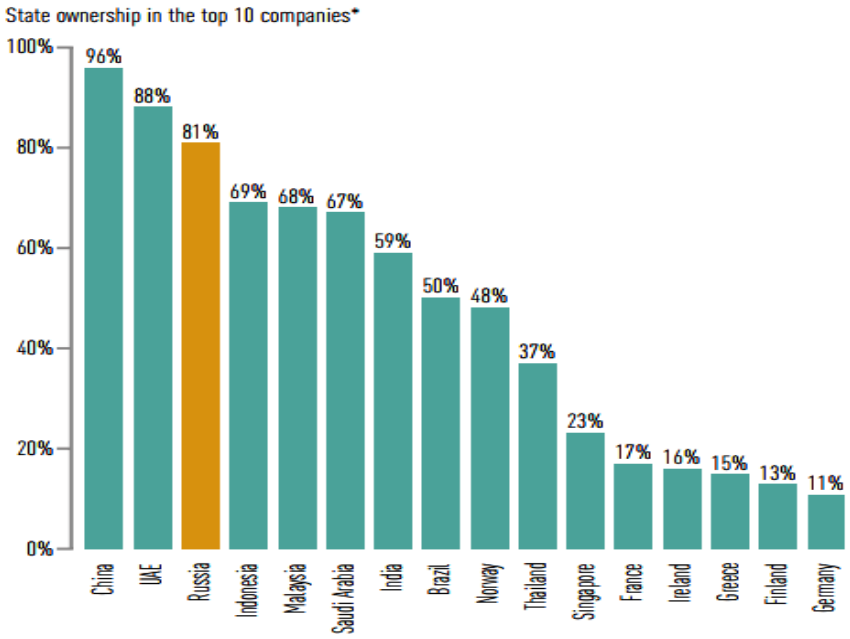


Note: Small business including micro-enterprises. Large businesses are companies with over 250 employees.
Source: Eurostat (2012), ABS (2012), British Columbia's Statistical Service (2012), Asian Development Bank (2014), Rosstat (2015), BCG analysis

Source: Kuznetsov, 2016

[13] http://www.ntf.ru.
[14] http://engineer-cadry.ru/.
[15] http://www.ntf.ru.

Figure 2.23. Government's share in top 10 enterprises, by country



Note: Only countries with the share of the public sector >10% are shown.
**Calculated as the average of the state shares in the revenues, asset value and capitalization amount of the top 10 companies*
Source: "State-owned enterprises in the global economy: reason for concern?" P. Kowalski et al (2013).

Source: Kuznetsov, 2016

A distinguishing feature of the Russian R&D system was the fact that the federal budget for state-owned enterprises (SoEs) and branch R&D organisations accounted for the majority of businesses' R&D expenditures (IPP, 2016). Few initiatives were implemented to stimulate SoEs' innovativeness and create demand for innovation in the focal period.

In 2010, the government introduced a requirement for the largest SoEs to form an Innovation Development Programme (IDP) that was to take the priorities of the state scientific, technical and innovation policies into account. The IDP contained a set of activities aimed at developing and introducing new technologies, innovative products, and services corresponding to the global level, and covered the innovative development of Russia's key industries. SoEs were tasked to cooperate with universities and research institutes to achieve the targets. As a result, the R&D and innovation expenditures of the largest SoEs increased from 1.59% to 2.02% of sales between 2010 and 2014 (IPP, 2016).

In 2013, the existing public procurement system was amended. The new Federal Law on Public Procurement established a single order-placement procedure. In addition, it specifically provided for the procurement of high-tech and innovative products, goods and services from SMEs, thereby encouraging SoEs to establish business links with innovative SMEs.

In 2011, a major initiative was introduced to create a network of technology platforms to serve as communication tools. The aims were to pool together all NIS stakeholders in order to attract additional resources and, thereby, intensify the creation of promising commercial technologies and innovative products (services), and to improve the regulatory framework in the field of scientific, technological and innovative development. From 2011 to 2014, 35 Russian technology platforms[16] were created with the participation of a wide range of stakeholders (i.e., leading scientific and educational organisations, large and medium-sized manufacturing enterprises, small businesses, public associations). In total, more than 3,500 organisations were members of Russian technology platforms (Innovation.gov.ru, 2016). In 2012, the Ministry of Education and Science collected proposals on the research needed to support the development of technological platforms As a result, calls for tenders were released for carrying out scientific and research work. The Ministry of Education and Science allocated more than RUB 3 billion to 490 contracts with technology platforms.

Those NIS-development institutions, such as Skolkovo and RUSNANO, that were launched in the focal period with the aim of finding innovative projects and supporting their commercialisation were faced with the fact that there were few promising projects on the market. Most projects utilised ideas that were developed during *perestroika* and subsequent reforms (Rashidov, 2012). In 2009, to stimulate the emergence of new projects and spin-off companies, changes were made in the legislation governing the exploitation of intellectual property arising from public research. The revised legislation established the procedures for its transfer. With its adoption, the budgetary institutions of science and education were given the right to independently establish companies without the consent of the state; to use results of intellectual activity, monetary funds and other property; and to independently use incoming revenue from the disposal of shares.

In 2013, amendments to the federal law enabled public research institutes and universities to create business partnerships for the purpose of transferring intellectual property on the basis of licensing and commercialisation.

In 2010, the active development of federal and regional "innovation elevators" for technology projects began. These "elevators" were designed to enable thousands of young people to realise their scientific potential in Russia, and to become successful and prosperous through the commercialisation of their innovations. From 2009 to 2013, the

[16] http://mrgr.org/tp/.

Federal Agency for Youth Affairs implemented the Zvorykin Innovation Project[17], which was aimed at popularizing innovation among Russian youth. The project consisted of several stages, as shown in Table 2.17. The project itself became a platform for communication and for establishing links among NIS participants.

Table 2.17. Innovation elevator project for young entrepreneurs

Search and registration	Selection and education	Support	Results	Heroisation
Identification of innovative projects in certain areas among independent innovators and spin-off companies ▪ Energy efficiency and energy savings ▪ Nuclear technologies ▪ Space technologies ▪ Medical technologies ▪ Strategic information systems	Project-related expertise and creation of rating based on: ▪ Expert assessment ▪ Thoroughness ▪ Prior participation in contests ▪ Scientific publications At this stage, regional and federal conventions, internships, educational programmes, exhibitions, and meetings with the scientific and business elite were held, and legal support was provided.	Zvorykin National Innovation Award for the best projects; awarded in the solemn atmosphere of youth-innovation conventions: ▪ Grants ▪ Study-abroad programmes ▪ Prizes Participants ▪ Venture funds ▪ State funds ▪ Technoparks ▪ Business incubators ▪ Strategic investors	1. Successful, innovative companies created by project participants 2. Innovative ideas examined and included in the commercialisation process 3. Business projects in the field of innovation ready for implementation 4. Companies focused on the production of innovative products	▪ Enhance the status of innovators ▪ Create an innovation trend

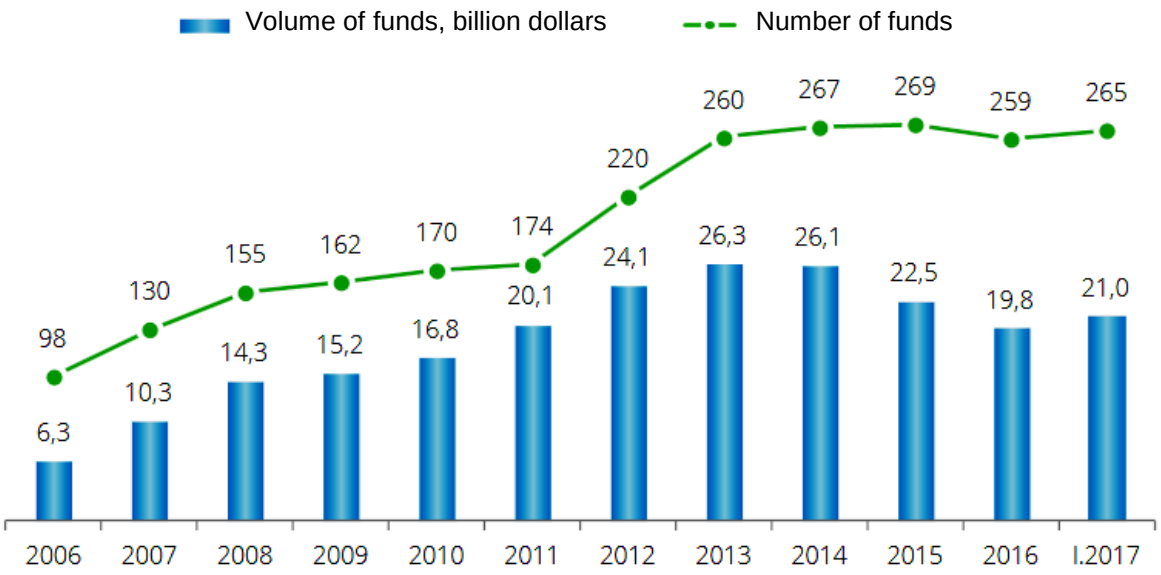
Source: Rusnanonet[18]

In 2013, a project with similar methodology was implemented under the leadership of RVC. The project was known as GenerationS-2013. By 2013, there was an understanding that the few nascent entrepreneurs present in Russia were generally incapable of ensuring their innovation's commercial success, as they did not have the necessary competencies or vision to manage business development. Therefore, GenerationS-2013 introduced a mentoring institute (Ryndin, 2013).

In this period, the direct investment market and venture investment market were developing. Therefore, the number of funds and their capitalisation rose (Figure 2.24).

[17] Named in honor of the prominent scientist Vladimir Zvorykin, who was born in Russia in the early nineteenth century. At the time of the Russian Revolution, he immigrated to the USA, where he carried out his research and engineering activities.
[18] http://www.rusnanonet.ru/nns/36853/info/#title

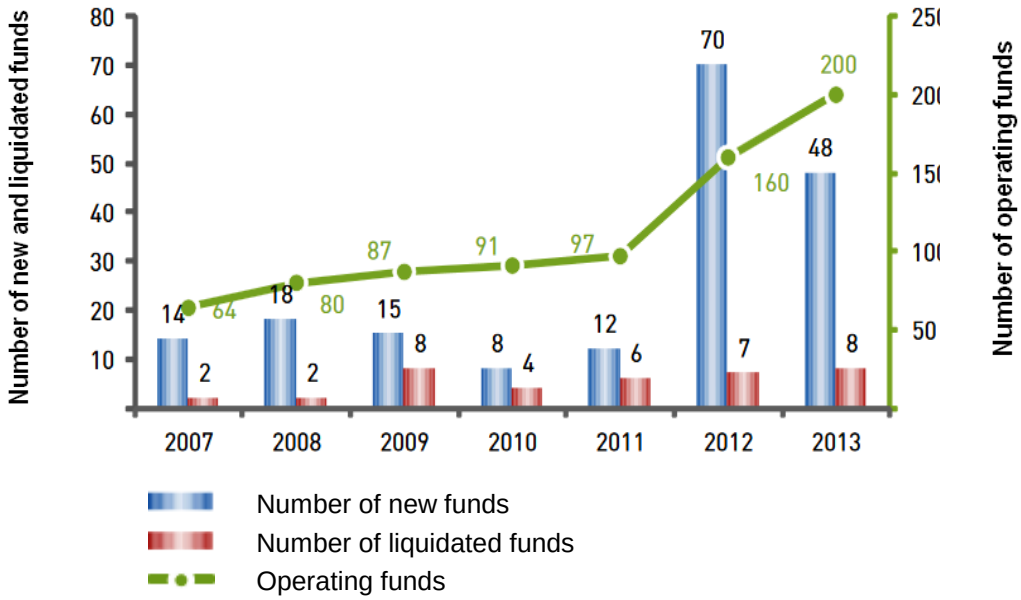
Figure 2.24. Number of operating ventures and equity funds



Source: RVCA, 2017

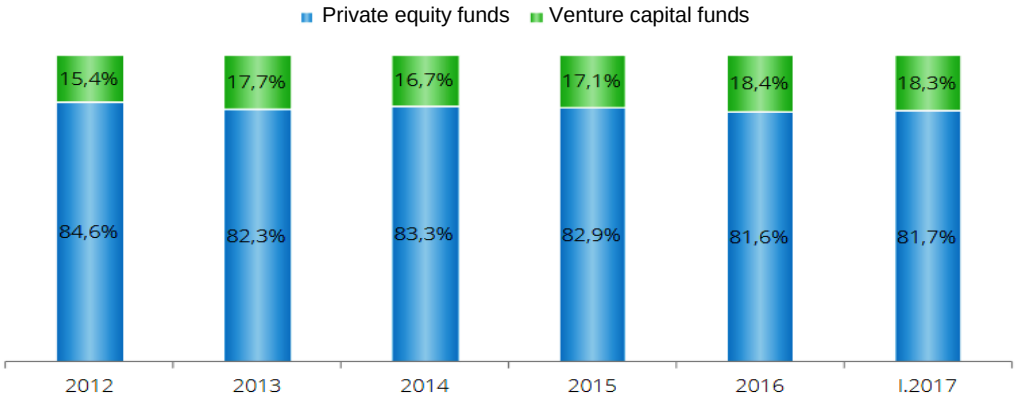
According to estimates from the Russian Venture Capital Association, the increase in the number of funds in this period was primarily driven by an increase in the number of venture funds, including seed funds focused on the early stages of the organisational lifecycle (Figure 2.25). By 2013, these funds amounted to 63.8% of the total number of funds. In terms of volume, the venture funds had a share of 17.7% (RVCA, 2013).

Figure 2.25. Number of venture funds



Source: RVCA, 2013

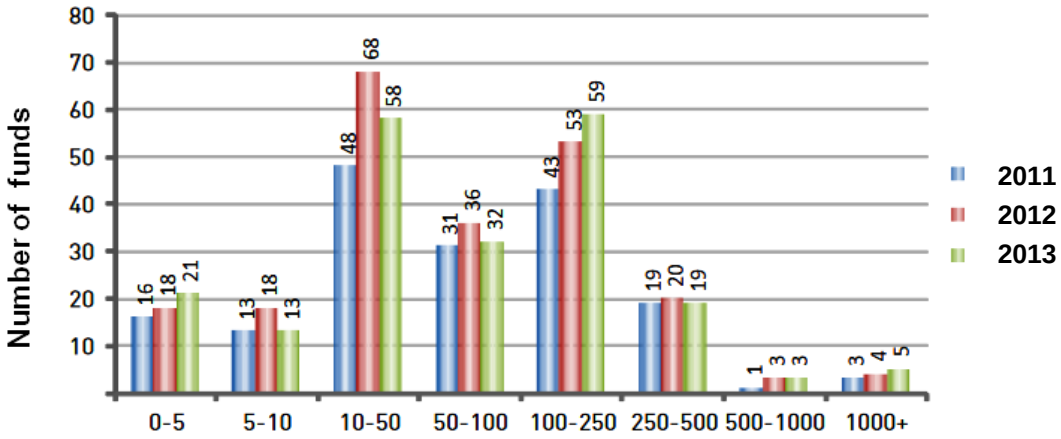
Figure 2.26. Proportions of private equity and venture funds, by volume



Source: RVCA, 2017

Despite the Russian investment market's ongoing development, it undiversified in terms of fund size and regional coverage. There were very few large funds (see Figure 2.27), and more than 90% of investment activity was concentrated in the Central Federal District (RVCA, 2013).

Figure 2.27. Number of private equity and venture capital funds by volume, USD millions

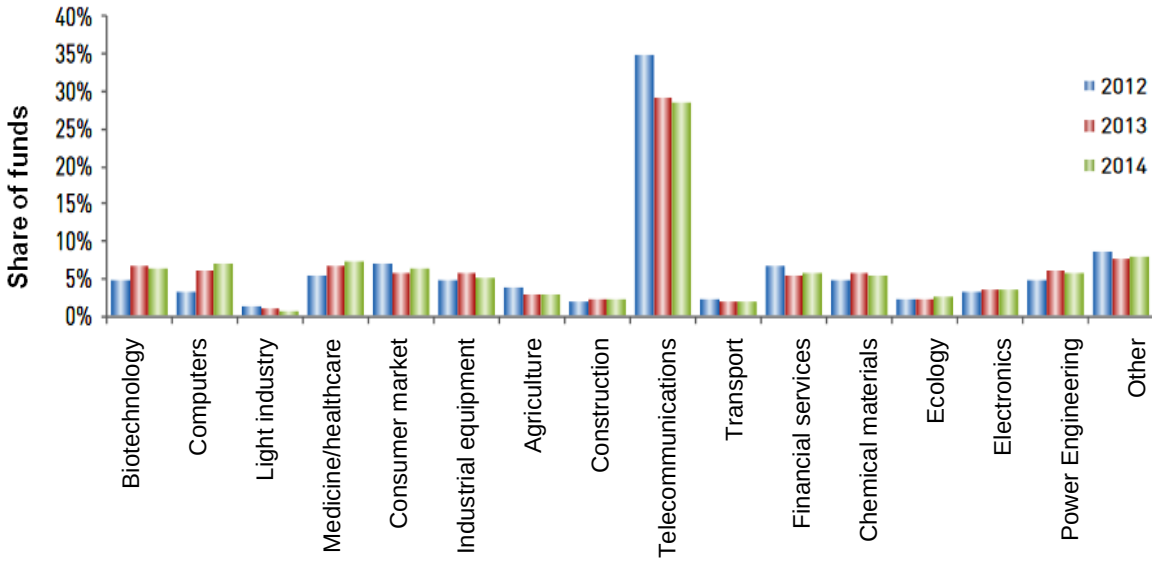


Source: RVCA, 2013

By the end of 2013, 53 funds had been formed. Some were completely reliant on capital provided through federal or regional budgets, while others were established through various public-private partnership programmes initiated by local and regional authorities, federal ministries, or development institutions. The total capitalisation of funds relying on state capital was at least USD 7.35 billion, which corresponds to slightly more than 25% of the total capital of all operating funds on the market (RVCA, 2014). Until 2013, it was possible to actively attract foreign investors to the Russian market as partners in joint private-equity funds (RVCA, 2014). These funds were vital for innovative start-ups, which needed financing when moving toward later stages of development. Moreover, venture investors were able to derive some investment income as a result of later-stage financial deals.

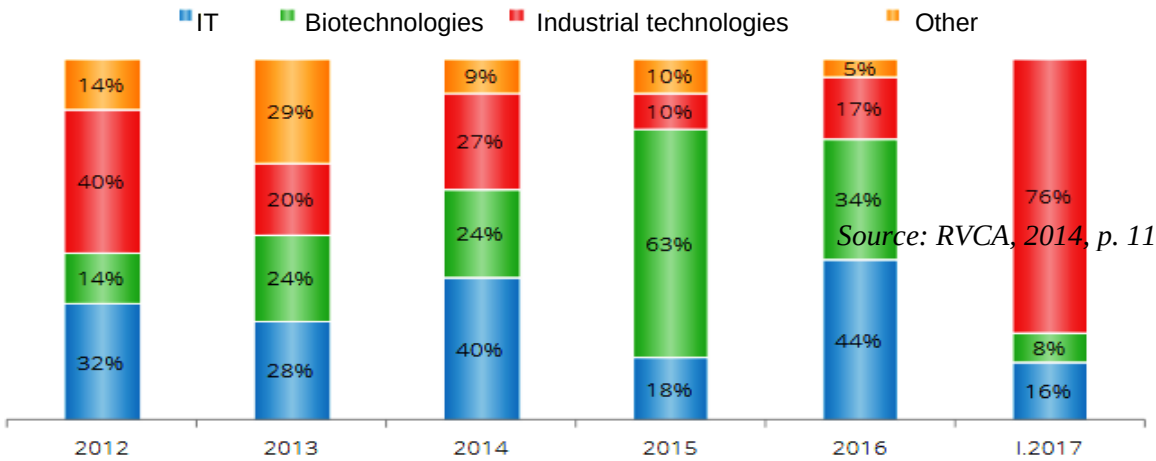
Throughout the history of the Russian venture market, funds' industry preferences had been uneven. In fact, more than 30% of total equity and venture investments went to the information and communication technologies sector (Figure 2.28). At the same time, venture investments of private funds and corporate funds prevailed in this sector: 91% of all private venture investments and 98% of all corporate venture investments went to the telecommunications sector in 2013 (RVCA, 2014).

Figure 2.28. Industry preferences reported by venture and equity funds



In 2013, funds with state participation invested approximately equally in the telecommunications, biotechnology and industrial technologies sectors. In this regard, the state attempted to offset the clear investment bias toward the IT sector (see Figure 2.29) that arose as a result of that market's attractiveness in terms of speed and return on investments.

Figure 2.29. Distribution of venture investments by funds with state participation, by sector



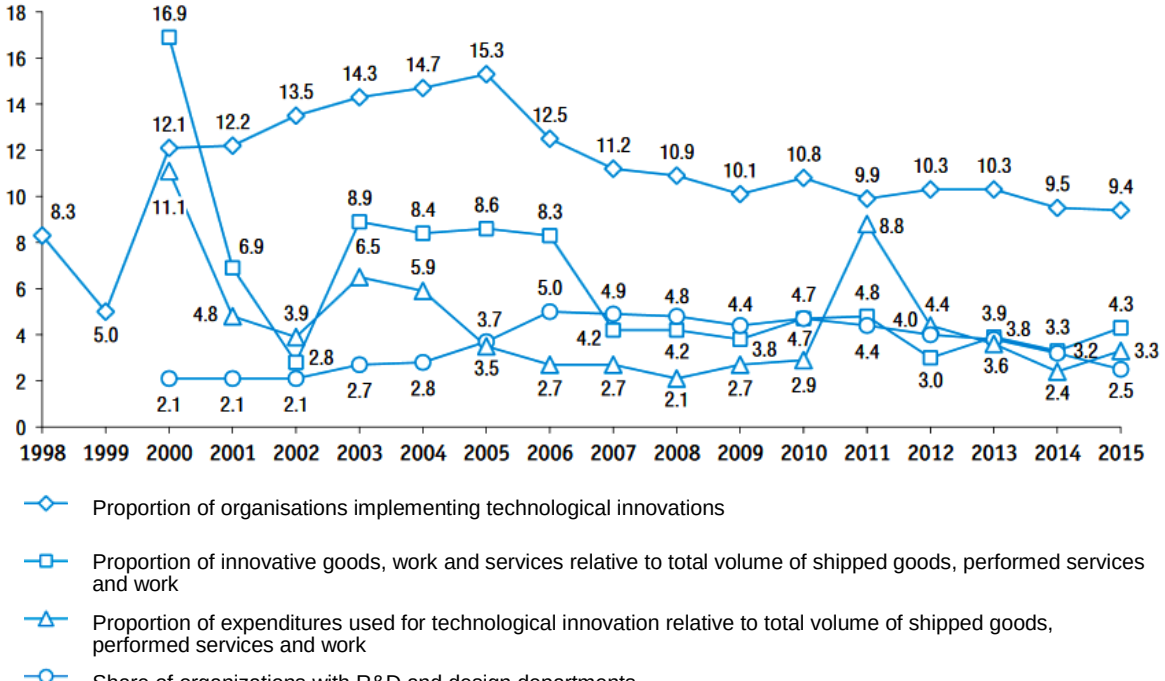
Source: RVCA, 2014, p. 11

Source: RVCA, 2017

In fact, as of 2013, the information technologies and telecommunications sector was the only sector that existed and was financed due to market mechanisms (Mincomsvyaz, 2013). The indicators for innovative activities in this sector were higher than those for other sectors (see Figure 2.30; compare with Figure 2.12), but they were still not high enough to compete with the corresponding indicators for most foreign countries.

In 2013, a new venture fund was established through the initiative of President Putin with the direct participation of the ASI using extra-budgetary funds provided by private businesses. The fund, which was designed to actively develop Internet entrepreneurship, was named the Internet Initiatives Development Fund (IIDF). The purpose of this fund was not only to support high-tech Internet projects but also to develop the sector as a whole by organising various educational and infrastructural activities in Moscow and other regional markets (Sukharevskaya, 2016). As of 2017, IIDF was one of the most active non-state-sponsored development institutions.

Figure 2.30. Innovative activity of companies in telecommunications

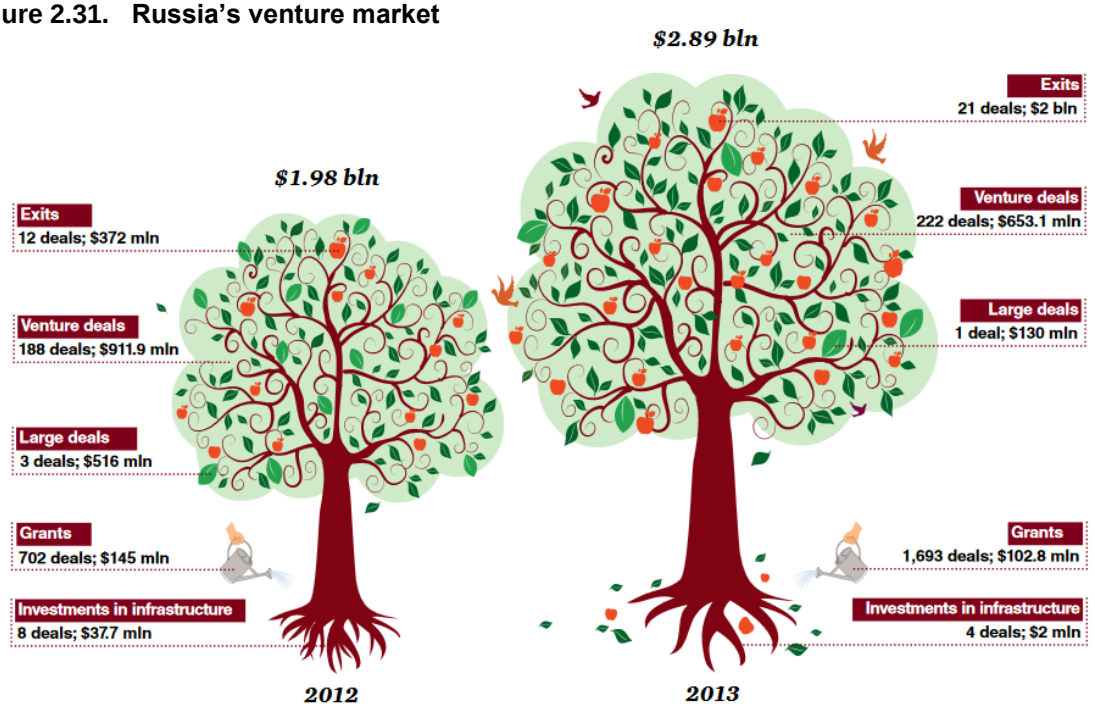


Source: Gorodnikova et al., 2017

In the same period, the number of business angels grew rapidly. Some of them were Russians who had left the country during the *perestroika* and post-reform period to became entrepreneurs in the US, Israel or Germany. The growth in angel investments was most evident in 2012 and 2013. In 2013, angels provided more than USD 117 million to start-ups, which funded about 100 projects (NABA, 2013).

In general, the efforts to develop the Russian venture ecosystem in this phase resulted in an increase in both venture investments and exits (see Figure 2.31) (PwC and RVC, 2014).

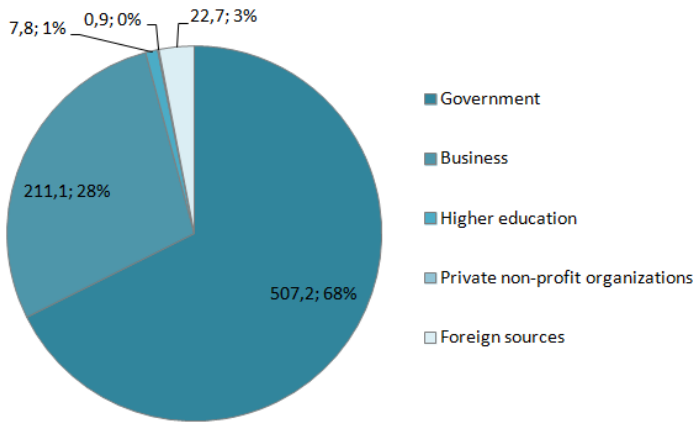
Figure 2.31. Russia's venture market



Source: PwC and RVC, 2014

While the formation of the venture market was an important positive factor for the development of the Russian NIS in this period, its volume still remained extremely low compared to the total intramural R&D expenditures and allocated state funding. In 2013, the total venture market only corresponded to 10% of all intramural R&D expenditures, 68% of which were financed through funds with state participation (see Figure 2.32) (Voynilov, 2017).

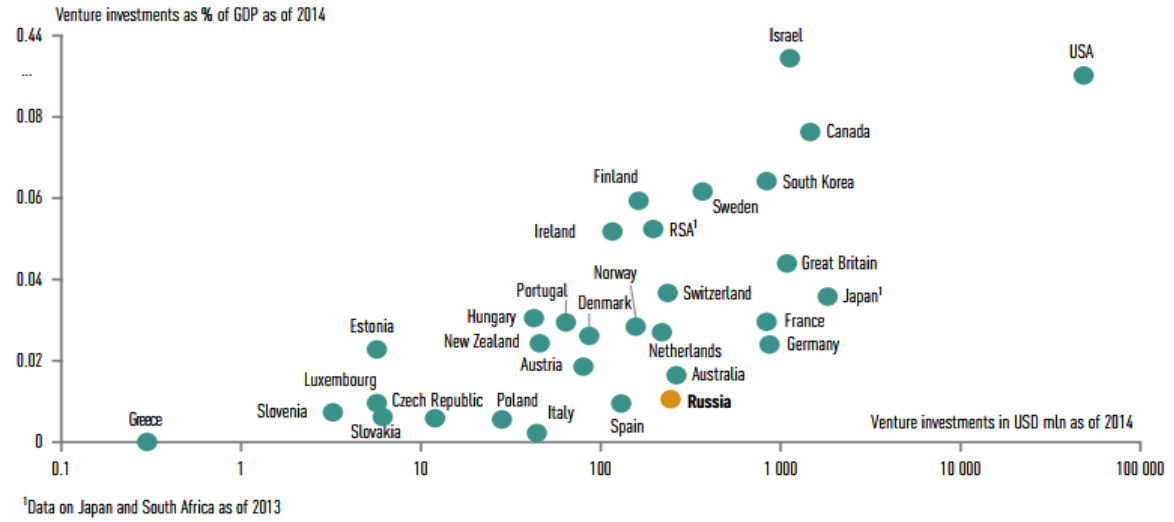
Figure 2.32. Total intramural R&D expenditures by financing source, 2013, RUB billions and %



Source: Voynilov, 2017

In general, the Russian venture market did not reach the critical mass needed to allow it to become an effective lever for innovative development (see Figure 2.33).

Figure 2.33. Venture market as % of GDP, 2014



Source: Kuznetsov, 2016

In this period, technoparks associated with higher-education institutions and industrial complexes continued to develop. The High-Tech Association of Technoparks and the Industrial Association of Technoparks were established with the aim of serving as self-regulatory organisations responsible for coordinating the network of technoparks after the end of the state programme.

In 2013, the comprehensive programme "The creation of technology parks in the Russian Federation in the sphere of high technologies" underwent several changes. In March 2013, as a result of a public fund expenditures audit, the conditions for allocating funds were revised and a procedure for selecting programme participants on a competitive basis was introduced. In addition, control over the use of funds was significantly strengthened by introducing constant monitoring of performance indicators and on-site inspections of the technopark projects. Thereafter, the need to develop standards for technoparks was put on the agenda.

The development of accelerators and business incubators also began in the focal period. This occurred because venture funds wished to enhance the quality of start-ups and their development speed in order to increase their return on investments, and because higher-education institutions were running projects aimed at providing assistance with commercialisation. The latter were introduced in 2011 and 2012 using public funds provided in accordance with the regulation "On State Support for the Development of Innovative Infrastructure in Federal Educational Institutions of Higher Professional Education" (RUB 2 billion in 2011 and RUB 3 billion in 2012; RG, 2010).

In 2013, a new project was launched in the field of innovation-infrastructure development. The project aimed to create a network of engineering centres that would be associated with

higher-education institutions. In the first competitive selection round, 91 higher-education institutions submitted 96 proposals for the development of engineering centres. Consequently, 11 higher-education institutions and their 12 programs received funding for the development of engineering centres in the following areas: composite materials, laser and additive technologies, and computer engineering. The total amount of state support allocated in in 2013 was RUB 500 million.[19]

In addition to the development of commercialisation infrastructure, one important achievement was the establishment of an innovative community. Qualified experts and mentors, business angels, and investment specialists became available to assist start-ups in the development of their business.

Information and transparency

This period was characterized by widespread coverage of events in the press and through official sources. In 2012, the "Open Government" project was launched, the goals of which were to provide timely information on the work of ministries, departments and other public authorities; introduce mechanisms to allow feedback to flow between authorities and society; and ensure transparency for the purpose of exercising public control, which should then enhance the efficiency of authorities' work and the quality of their decisions.[20]

In the same period, a large number of private initiatives were implemented in strategic partnership with RVC. For example, from 2012 to 2015, the private company GrienfieldProject ran the Russian Startup Ranking, which assessed the potential of Russian start-ups active in the high-tech, biomedtech, cleantech and IT/Internet/mobile areas (Tikhonov, 2013). Starting in 2010, the private company Digital October organised more than 3,000 events, ranging from educational lectures for the general public on the topic of technology entrepreneurship to speeches by gurus in management and entrepreneurship (e.g., Mark Zuckerberg, Guy Kawasaki, Steve Wozniak) to major events, such as TechCrunch Moscow, as well as numerous professional conferences in the field of entrepreneurship.[21]

Numerous on-line platforms and sites were also launched, which served to disseminate information and build relations among NIS participants. The international forum "Open Innovations" was launched in 2012. It became a global platform for discussing numerous issues related to the construction of the NIS on both the country and global levels.[22]

[19] http://innovation.gov.ru/ru/taxonomy/term/2356.
[20] http://open.gov.ru/.
[21] http://digitaloctober.ru/.
[22] https://forinnovations.ru/about.

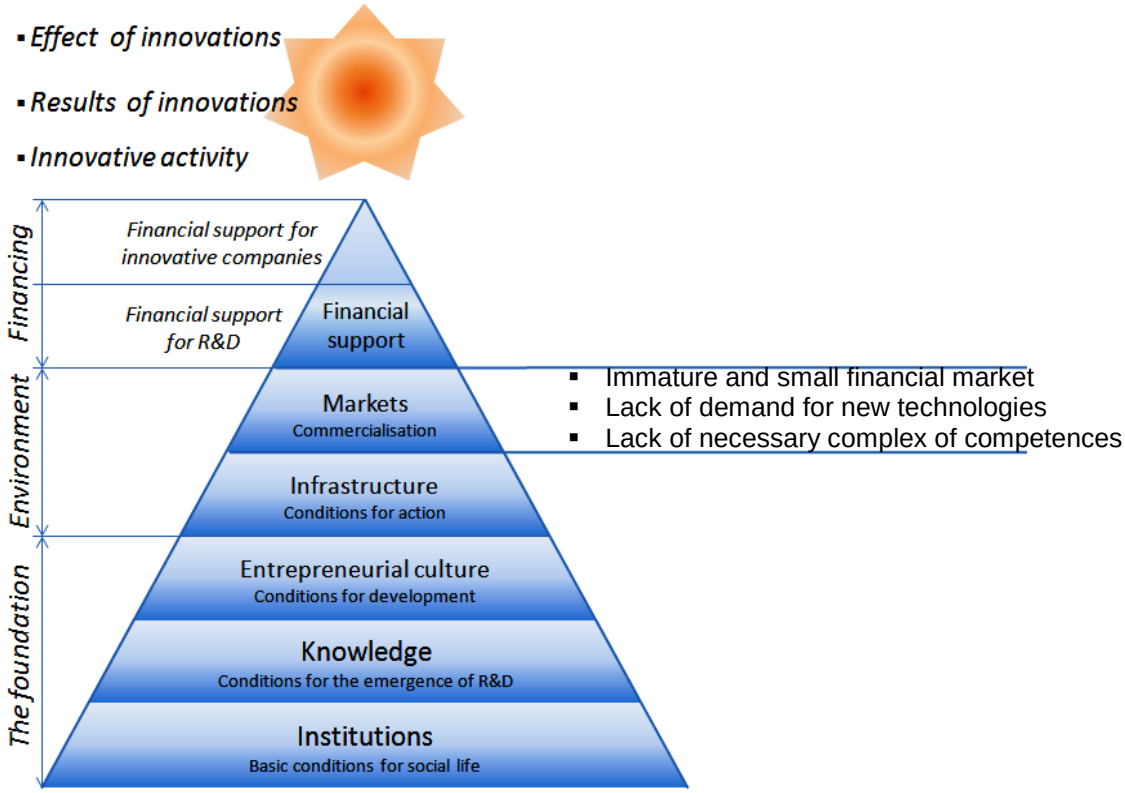
Implications for innovation and networking

The focal stage can be described as a period of continued build-up of the innovation climate in Russia in terms of policy improvements, consolidation of material and human resources, and the taking of a key step towards creating an innovative culture. It was marked by the implementation of a wide range of governance measures aimed at NIS development in terms of creating framework conditions, introducing new governance tools and development institutions for innovation, providing resources, stimulating demand for innovation, stimulating relationship building among participants in the innovation community, and providing opportunities for public and non-profit organisations and innovators to participate in the organisation and management of innovation projects. This stage encompassed the launch of numerous processes related to the development of the Russian NIS and technological entrepreneurship, including some aimed at ensuring that Russia met international requirements.

Considering Russian NIS using the model of the innovative pyramid (Figure 2.34), it can be concluded that its three foundation layers were formed by 2014. Infrastructure layer in general was formed, although the state continued to play the key role in its management and financing. In addition, the state-based financial support system had just begun a gradual transition from direct financing towards providing support on a competitive basis.

Efforts to increase the number of innovative SMEs in this period and to launch market mechanisms for their financing had some success, although market-based venture-capital financing remained low. The number of high-quality start-ups (meeting the requirements of an experienced, competent team; a protected technology; and a developed, competitive product with high market potential) was insufficient to allow for rapid growth of the venture-capital market. Most start-up owners did not have enough experience or knowledge to develop their businesses and become attractive for the venture market (Andrushchak et al., 2018). In addition, demand for innovative products did not organically emerge in either B2C or B2B markets. Therefore, it was nearly impossible to assess the market attractiveness of innovative products. As a result, market-investment mechanisms were only introduced in one sector – IT and telecommunications – as this sector was actively developing due to high demand for IT solutions. In other sectors, start-ups were mostly supported by public funds in the form of grants or venture-capital investments provided by public-private funds.

Figure 2.34. Extent of Russia's NIS by 2014



Source: Karmyshkin, 2015

Significant changes occurred in terms of involving not only professionals but also the general public in discussions of issues related to innovation. The term "innovation" became a buzzword, although there was no unified agreement on its meaning. In accordance with the Triple Helix (Etzkowitz and Ranga, 2013) spaces of knowledge, innovation and consensus, Russia had already moved along the path of knowledge restoration and basic innovation infrastructures building. The country therefore needed to focus on creation of the consensus space. This meant moving well beyond formation of development institutions, and infrastructural and framework conditions. It was necessary to create a set of activities that would draw NIS actors from different spheres into collaborative processes, and bring them together to brainstorm, discuss and evaluate proposals for advancement towards an innovation-based economy. The idea was to initiate a cross-fertilizing environment in which diverse perspectives and ideas could be generated, and results could be achieved that the actors were unlikely to have accomplished individually (Etzkowitz and Ranga, 2013). According to Etzkowitz's theory of the consensus space (Etzkowitz and Ranga, 2013), government and non-government actors needed to interact continuously to exchange resources and negotiate shared purposes. Innovation could be accelerated by strengthening the dialogue and collaboration between national and regional

NIS stakeholders; creating new platforms for communication; and promoting collaborative governance measures, such as public consultation and feedback, and collaborative leadership models and practices (Chrislip, 2002; Archer and Cameron, 2008). As the perceived goal was to make the NIS a self-governing, market-led system, it was necessary to ensure that government did not occupy a privileged position, although it could participate and take the initiative on an equal basis with others. This approach could help increase the transparency in the state's governance boundaries, thereby beginning to counteract the loss of trust in the government that occurred during *perestroika* and the period of privatization. Another goal was to create a boom in public entrepreneurship by spurring individual innovation efforts, and providing the energy and focus needed for talented people to release their intellectual and entrepreneurial potential to create innovation firms. A wide range of networking activities was implemented, including entrepreneurial training programmes and business-projects competitions, accompanied by extensive positive coverage of all of these events in the press. The aim was to create a broad innovative community in which entrepreneurs, firms, universities and local government actors began to see themselves as part of a larger whole (Etzkowitz and Ranga, 2013) committed to building a strong innovation system in Russia.

Russia's NIS system was based on a "technology-push" approach (Dezhina, 2016) and was heavily supported by public funds. Scientific efforts mainly concentrated on achieving breakthroughs in chosen "critical areas" (e.g., aerospace, nanotechnology, nuclear technology, energy, biotechnology) through the development of new technologies. In the short term, this policy neither led to the creation of a large number of new, highly innovative companies nor supported the needs of existing businesses, which were addressed through the use of foreign high-tech products.[23]

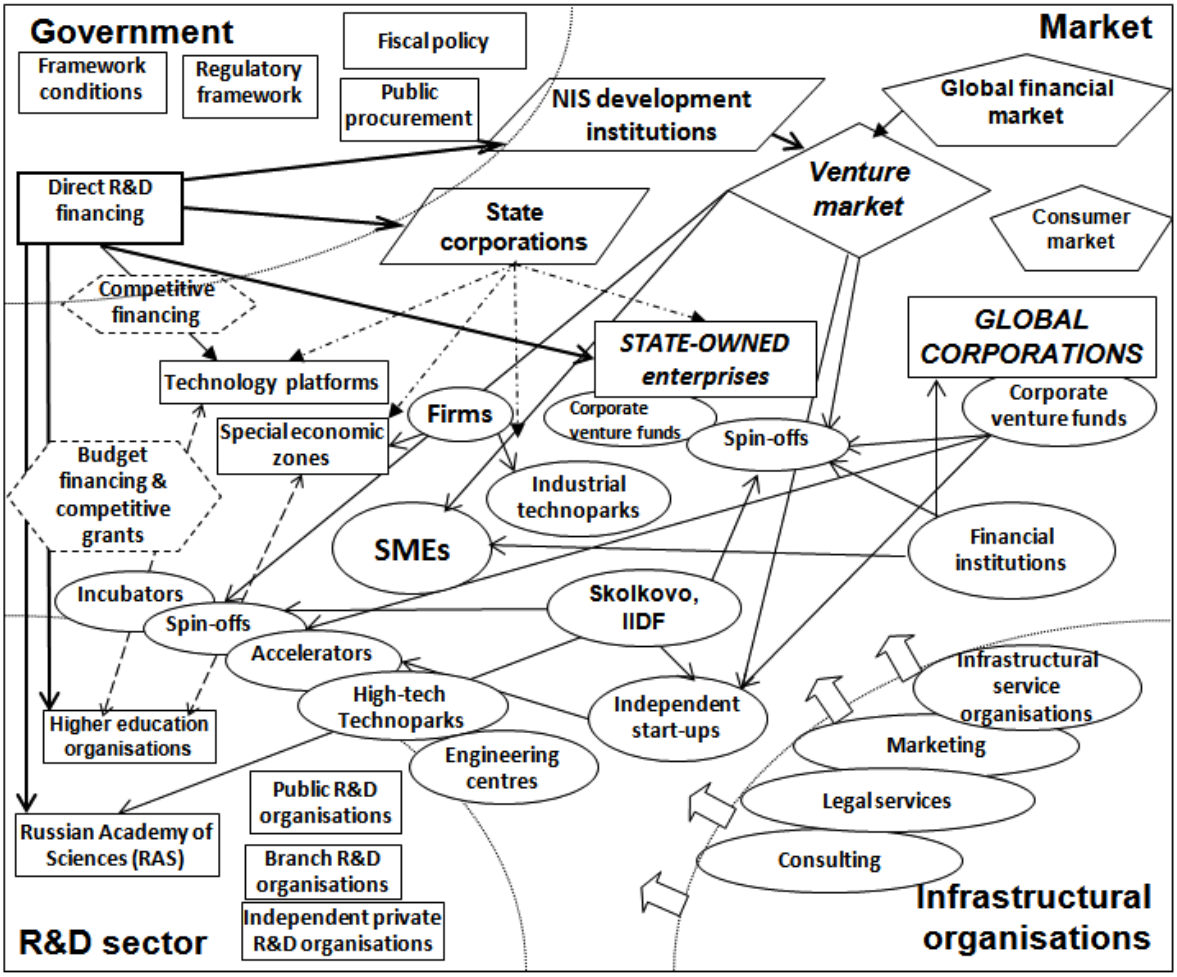
As a whole, the state of the innovation system by 2014 can be characterised as a multidirectional chaotic movement (Brownian motion) of various innovation ecosystem actors with different cognitive frames, values, motives and behavioural norms. In the absence of sufficient experience and competencies, they innovated and experimented, and developed their own strategies and business models with the aim of occupying a certain niche in a newly created innovation domain and related markets. This period had the highest degree of activity in the field of communication (everyone communicated with

[23] As of 2013, an estimated 40% of Russian companies' production costs were attributable to foreign high-tech equipment and components. In some industries, this figure reached critical levels of 50-60% (e.g., the automotive, pharmaceutical, medical and instrumentation industries; and in the production of machine tools, electric machines and electrical equipment) (Simachev et al., 2016).

everyone when trying to understand the mechanisms of innovation) and in the field of multidirectional project implementation, which was largely possible due to the availability of state funding.

In general, all groups of key actors of NIS had appeared by 2014. The Russian NIS as of 2013 is depicted in Figure 2.35.

Figure 2.35. Russia's NIS as of 2013



Source: Developed by the author

The Figure 2.35 shows that the Russian NIS as of 2013 was a complex conglomerate of heterogeneous organisations that emerged in the Russian innovation landscape mainly due to the influence of the state, which continued to play a key role with regards to providing financial support, distributing resources and coordinating the activities of NIS participants. By the end of 2013, the government's main efforts were aimed at creating diversity among instruments and actors in the innovation space, and at introducing mechanisms for their self-organisation and self-financing. Overall, the government's innovation policy at the time can be characterised as a top-down policy in which decision making and resource distribution were centralised. A culture of innovation had not yet developed in society to

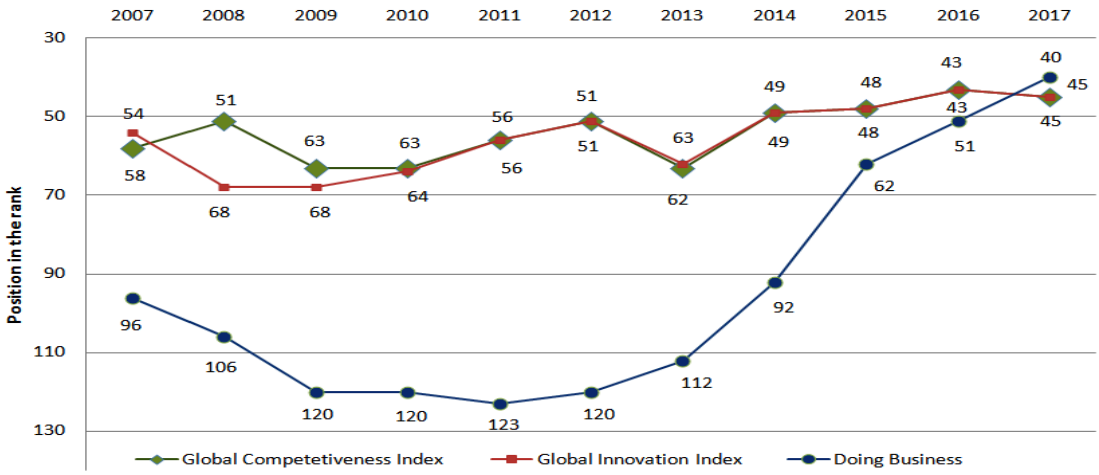
produce a bottom-up stream of independent innovators and organisations. Most innovation-development organisations were state-owned, and their spheres of responsibility were crossed and duplicated. As they were founded as part of an experiment aimed at confirming the feasibility of innovation-driven strategy of national economy development, these organisations had to demonstrate quick success, which led them to compete for the opportunity to provide support to the few technologies found and innovators capable of realising commercialisation in foreseeable future (Rashidov, 2012). Moreover, the fear of a misuse of public funds blocked their initiatives, and led to highly bureaucratic and inflexible mechanisms (Carayannis et al., 2016). Nevertheless, certain elements of self-organisation among NIS players began to emerge in the form of associations and communication platforms. In the nascent innovation space, few private organisations provided services to innovators, as their offerings were not in demand among newly emerging start-ups. Such start-ups did not understand how businesses should be organised and they could not afford to pay for professional services.

A number of initiatives were expected to contribute to the development of the innovation system. Among them were the introduction of mechanisms to stimulate the development of technological entrepreneurship on the basis of universities, measures to stimulate the establishment of links between industry and science (see Figure 2.21), and measures to stimulate demand for innovation in state corporations. In order to create a sustainable system that produced innovative start-ups, a number of changes were adopted in the legislation regulating innovation activity in higher-education institutions, and universities were forced to adapt their activities in order to become "entrepreneurial universities". More specifically, they were required to reach a certain level of performance in terms of commercialisation indicators. Grants and subsidies were allocated to support the creation of an innovative infrastructure around technological universities with the aim of commercialising scientific developments (including, e.g., incubators, accelerators and technology-transfer centres). However, faculty members, inventors, experts and students did not understand the basic concepts of IP protection and usage, and they did not have the competencies necessary for commercialisation (Carayannis et al., 2016). As result, the imposed objectives of engagement in technological entrepreneurship provoked resistance. Therefore, this initiative did not lead to the creation of a large number of successful “born-in-the-university” start-ups (Andrushchak et al., 2018). In terms of the need to stimulate demand for innovative products in the production sector, which was home to large, state-owned companies, the government’s efforts focused on the introduction of Innovation Development Programmes (IDP), which included the creation of corporate venture funds

and the implementation of open innovation mechanisms. However, most IDPs did not work in reality and their introduction did not lead to significant growth in innovative spin-offs (Kuznetsov, 2016).

Consequently, the innovation system remained inefficient. The extensive inputs in the form of funds and effort did not enhance the innovation performance of the production sector or improve Russia's global competitiveness (see Figure 2.36).

Figure 2.36. Trends in Russia's position in the Doing Business ranking, the Global Innovation Index and the Global Competitiveness Index



Source: Doing Business, GII and Global Competitiveness Index

As R&D and technology testing are long-term projects, most of the companies created in the focal period commercialised technologies that had been developed in previous periods, including the Soviet era. Moreover, there were few valuable technological solutions, so that investors and development institutions competed for the opportunity to support them. Numerous training and acceleration programmes, competitions, and events for start-ups and the innovation community conducted during this period (mostly in Moscow) created opportunities to access information, search for complementary competencies and obtain financial support. Knowledge in the field of Russian technological entrepreneurship was largely informal and embedded in people. More experienced NIS participants willingly shared their knowledge with newer actors, seeing this as their contribution to the development of the NIS. From this point of view, networking was the main method of learning and it was actively used by innovative start-ups.

However, the complexity of the Russian NIS that resulted from the dynamic modifications of regulations, the constant changes in the composition of NIS actors, the rules for development institutions' support programmes, the lack of a common terminology, the

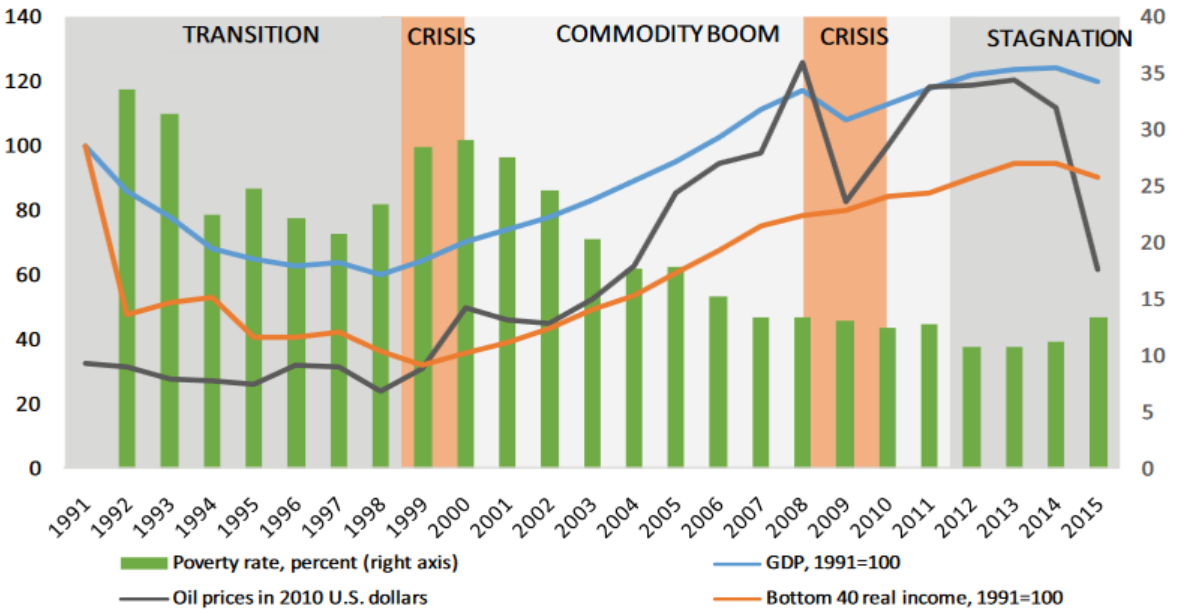
different cognitive frames, and the incentives of innovators, venture capitalists and government representatives (Andrushchak et al., 2018) created a high degree of uncertainty. They also resulted in high transaction and coordination costs for networking, and entailed a variety of risks for entrepreneurs (Carayannis and Dubina, 2014), as shown in Table 1.7.

Phase 5: 2014 – 2018

In this period, the aim of eliminating the structural and operational imperfections in the Russian NIS was supplemented with a need to solve problems of a different nature. The construction of the Russian innovation ecosystem in this period was greatly affected by the geopolitical situation, which led to economic destabilisation. The situation also created an acute need to intensify innovative activities to ensure a transition to an innovative development path despite the limited access to financial and technological resources caused by the sanctions imposed by Western countries.

In 2013, the economic stagnation (see Figure 2.37) manifested in a decline in industrial production (Baranov, 2013) and a significant reduction in GDP growth (from 3.7% in 2012 to 1.8% in 2013) (Rosstat, 2016). This led to the flight of investors from Russian markets. In the seven months after July 2013, Russian funds lost more than USD 2.5 billion (Gaydayev, 2017).

Figure 2.37. Indicators of Russia's economic performance



Source: World Bank, 2016

The sharp decline in foreign investments continued in 2014 as a result of sanctions imposed by Western countries, as well as the slowing of the economy and the devaluation of the rouble. Reductions in the inflow of foreign investments took place against the backdrop of an outflow of domestic capital caused by political uncertainty and economic instability (Pukhov, 2014).

As a result of the economic crisis, companies reduced their innovation activities. In general, most companies maintained their R&D budgets, which, owing to the devaluation of the rouble, meant that they were actually reduced (Dezhina, 2016). In 2013, the conditions for doing business faced by SMEs worsened as a result of the twofold increase in insurance premiums (Gorovtsova, 2013). In 2014, the procedure for registering companies became more complex (e.g., long timeframes; difficult, multistage licensing and permit application procedures) (Dezhina, 2016). In the face of these negative trends, which were exacerbated by the fact that there were no promising projects in terms of innovative potential, the size of the venture market sharply decreased from USD 2.89 billion in 2013 to USD 1.69 billion in 2014 (USD 2.19 billion in 2015; USD 0.41 billion in 2016) (MoneyTree 2014, 2015 and 2016). Foreign investors began to invest more cautiously in Russian projects. Moreover, in their attempt to diversify risks, Russian investors began to increasingly invest in foreign markets (RVCA, 2016), thereby diverting already scarce financial resources from the Russian market.

The difficult economic and geopolitical situation gave rise to demands to increase productivity to ensure diversified growth, and to implement vital structural and institutional reforms (Gokhberg, Kuznetsova, 2016). A change in the innovation strategy was necessary. In particular, special attention was paid to overcoming the economy’s raw-material orientation, implementing a rational import-substitution policy, and increasing the efficiency of budget fund use.

Two programmes were approved in April 2014: "Economic Development and Innovative Economy" and "Industry Development and Enhancing its Competitiveness". The objectives of these programmes were to create advanced innovative infrastructure for the development of new industries and markets, to remove regulatory barriers, and to generate favourable conditions for bringing innovative products to the market. In particular, the programmes aimed to develop industries oriented toward the consumer market by increasing extra-budgetary sources of financing, ensuring a phased reduction in the amount of direct state financing of industries, and focusing government-support instruments on stimulating demand.

Within the defence-industrial complex, the task was to intensify the utilisation of production capabilities for the development and production of new types of weapons and military equipment. The defence-industrial complex was assigned a special role as the engine of innovative production in the spheres of dual-purpose products (Diveeva, 2015). In December 2014, the National Technological Initiative (NTI) – a set of measures designed to create fundamentally new markets and, thereby, generate conditions for Russia to become the global technological leader by 2035 – was announced.[24]

Until 2015, the main focus was on supporting science and start-ups, especially through initiatives that could change the innovation landscape. These initiatives included RAS restructuring; the establishment of development institutes focused on start-ups and venture market development; and the introduction of the NTI, which was expected to become a unifying platform for constructive discussions among government, business, science and education institutions. The NTI was also designed to serve as a key tool for identifying strategically significant development areas and aligning the efforts of all NIS members in order to accelerate the achievement of the goals. This was particularly important given the limited financial resources and the pressure exerted on Russia by the sanctions, which forced it to build a more independent economy, address the need for import substitution and improve the global competitiveness of its domestic production sectors (Borovkov, 2016).

Given the limited budgetary resources, it was necessary to focus on the areas of innovation policy that could provide the most significant results in a short period of time. As such, starting at the end of 2015, considerable attention was paid to mature businesses, especially in terms of updating the Innovative Development Programs (IDPs), including the incorporation of KPIs to allow for efficient evaluations of plan fulfilment. In terms of the provision of public financial resources to NIS actors, there was a visible shift from allocation of budgetary funds toward the provision of targeted incentives and grants on a competitive basis (Kuznetsov, 2016).

In general, in the focal period, it was necessary to improve the financial and non-financial infrastructure of innovation, remove administrative barriers, provide the most favourable conditions for business and for the effective commercialisation of scientific developments, and increase demand for innovation from the public sector and large businesses. Other priorities included encouraging investments in high-tech sectors, adapting the educational

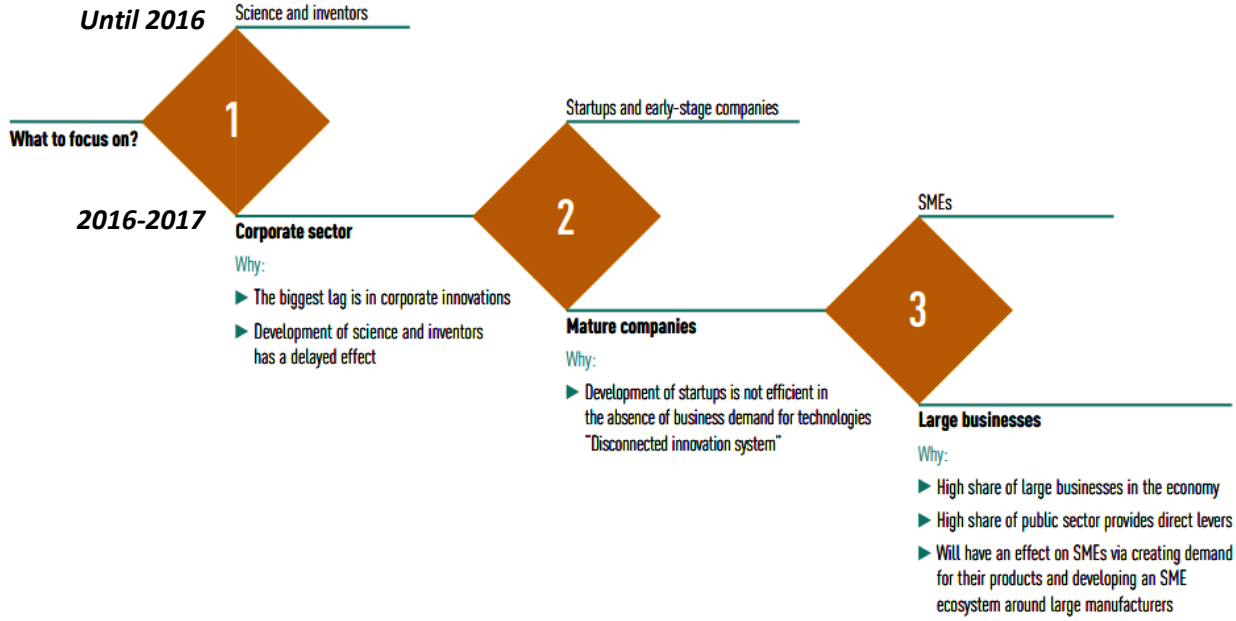
[24] https://www.rvc.ru/nti/.

sphere to the likely demands of the future economy, and ensuring the harmonious development of the country's regions by enhancing the use of existing scientific and technical potential (Gusev and Guseva, 2016).

Governance

As discussed above, the strategic direction of government measures changed dramatically in 2016. A transition to more targeted activities was carried out in three key areas (as shown in Figure 2.38), with an emphasis on measuring their efficiency and effectiveness (Kuznetsov, 2016).

Figure 2.38. Targets of Russia's state innovation policy



Source: Kuznetsov, 2016

At the national level, the focus of governance measures shifted to mature businesses, especially large enterprises. These businesses were offered opportunities to gain support in addressing such issues as patenting, exports, and government procurement. In addition, a few new large-scale projects were initiated (Kuznetsov, 2016). Programmes to support technological SMEs also experienced a shift in aims from focus on support for start-up emergence to stimulation of the growth and development of existing companies. This transition was generally consistent with international approaches, where there was a shift from the broad cultivation of innovative competences and general stimulation of entrepreneurial activity toward more targeted programmes, including the implementation of projects aimed at industrial development to support priority markets (Kuznetsov, 2016).

The key activities in this phase are presented in Table 2.18 (see also Appendix 2.1).

Table 2.18. Implementation of national innovation policy, 2014 – 2017

	2014-2015	2016-2017
Research and higher-education institutions	▪ RAS reorganisation, and project to measure and increase efficiency of scientists' work ▪ Active phase of state-sponsored programme "Academic Excellence Project" aimed at getting five Russian universities into the top 100 higher-education institutions ▪ Continuation of fundamental research support through the provision of mega-grants ▪ Launch of Federal Agency for Scientific Organisations (FASO) ▪ Establishment of Scientific Research Centre for aviation science – "Zhukovsky Institute" ▪ Improvement in funding mechanisms reflecting a transition from budgetary financing to competition-based grants ▪ Funding under the Programme for Science and Technology Development ▪ Creation of the Educational Fund "Talent and Success" and the educational centre "Sirius" in the city of Sochi; based on the Olympic infrastructure; goal: to create a network for additional education of children on a national scale ▪ Federal target programme for the development of education for 2016-2020 ▪ Introduction of an effective contract with employees in the field of education	▪ Creation and implementation of a system for evaluating scientific organisations' performance ▪ Merger of the Russian Foundation for Humanities (RFH) and the Russian Foundation for Fundamental Research (RFFR) ▪ Development of a list of pressing fundamental and applied problems by the NTI ▪ New "Strategy for scientific and technological development of the Russian Federation" ▪ Priority project "Universities as centres of innovation-creation space" ▪ Plan for implementing the Strategy for scientific and technological development of Russia for 2017-2019 ▪ Strategic initiative "New model of the system of additional education of children", including the development of a system of engineering and entrepreneurial education at the secondary-school level (e.g., a network of science and technology parks for children, known as Quantorium) ▪ Formation of the educational environment, research competencies and technological facilities needed to implement the federal programme "Digital Economy of the Russian Federation"
SMEs	▪ Construction of innovative territorial clusters: Skolkovo, Innopolis, MSU Valley ▪ Development of a network of technoparks ▪ Establishment of an Innovation Development Institute "The Federal Corporation for the Development of Small and Medium-Sized Enterprises" ▪ Launch of NTI ▪ Funding under the state-sponsored program on Economic Development and Innovation ▪ Transformation of GenerationS into a platform for the implementation of corporate acceleration tools ▪ Establishment of a requirement to obtain 18% of the aggregate annual value of contracts in public procurement of goods, work and services from SMEs ▪ Events for start-ups, e.g., Start-up	▪ Development of NTI strategy and roadmaps for priority markets ▪ Creation of the NTI project office as a division of RVC ▪ Funding under the NTI roadmaps ▪ Launch of branch venture funds ▪ Possibility to use tax benefits for stock ownership to stimulate private investments ▪ Approval of a set of measures within the framework of the Small Business and Individual Business Initiative Programme ▪ Development of the Strategy for the Development of Small and Medium-sized Entrepreneurship in the Russian Federation for the period up to 2030 ▪ As a part of the federal programme "Digital Economy of the Russian Federation", creation of an acceleration system for start-ups and SMEs in the sphere of information and digital technologies through the

	Village, TechCrunch	provision of information and investment support
Mature businesses	▪ Development and further actualisation of IDPs ▪ Creation of the Industrial Development Fund and launch of project funding ▪ Development of a system of tax incentives for innovation (approximately 70 measures) ▪ Engineering-development subsidies ▪ Subsidisation of investment-loan interest rates and R&D expenditures	▪ Establishment of the Technology Development Association (TDA) and Russian Export Centre (REC) ▪ Implementation of the Special Investment Contract (SPIC) mechanism, which provides for the conclusion of an agreement between an investor and the Russian Federation (or its entity); records the investor's obligation to master the production of industrial products within the stipulated timeframe and the Russian Federation's (or its entity) obligation to guarantee the stability of tax and regulatory conditions, and the provision of incentive and support measures ▪ Mandatory state procurement from SMEs ▪ Support of worldwide patenting ▪ National Champions Project ▪ Launch of the project "Development of innovative clusters – leaders of investment attractiveness on a global level" ▪ Compensation of up to 50% of costs incurred by Russian organisations when introducing modern, high-tech production equipment into pilot production ▪ Annual monitoring of the quality of IDP implementation, including measurement of success relative to KPIs ▪ The task of modernising existing enterprises in terms of using digital technologies and the creation of at least 10 leading companies that would be competitive in global digital markets by 2024.

Source: Developed by the author

In the focal period, the main efforts to ensure an increase in innovation activity were aimed at improving innovation capacity through supply-side interventions designed to help firms upgrade their capabilities. At the same time, demand-side reforms aimed to create more competitive, less monopolised markets. These reforms included the establishment of a market for SMEs in order to support their development by, for example, stimulating the innovativeness of large state-owned companies.

In the focal period, a significant amount of attention was paid to implementing measures to increase the efficiency of innovation in companies in which the state held an interest. An analysis of the implementation of their 2011 IDPs showed that the entire system had to be improved by expanding requirements for programmes' content and by strengthening

control over their realisation. In 2015 and 2016, the Ministry of Economic Development, in conjunction with the government's expert council and the institutes of innovation development, worked on updating the methodological basis and improving the requirements for IDPs (Rosimushchestvo, 2017). The state-owned companies were tasked with developing long-term IDPs that would take the possibility of business diversification into account and pay special attention to the commercialisation of solutions on the global market. The aims were to increase exports of innovative products, maximise import substitution, and diversify financing sources and instruments in order to minimise the dependence on public funds.

In 2016, methodological guidelines were formulated for assessing the quality and success of the implementation of IDPs in state-owned enterprises. The achievement of the KPIs for innovation activity that were incorporated in long-term company-development programmes was now included in the motivation systems for top management teams. The IDPs' quality criteria included the existence of a long-term vision for the direction of innovative development, the novelty and significance of key innovative projects for companies, and the sufficiency of financial resources to achieve the goals (Open Government, 2016). In 2017, an independent expert review was carried out on the basis of this assessment system. As a result, 29 companies received feedback and instructions for improving their innovation activities (Open Government, 2017). Annual monitoring of the quality of innovation activities of state-owned companies will also be carried out in the future. This system of measures was aimed at creating mechanisms to allow state-owned companies to take an active role in implementing their innovative programmes, thereby creating demand for innovations from SMEs through open-innovation tools.

A number of measures were also implemented to improve the management of public investments and increase the economic impact of public-infrastructure investments by enhancing institutional capacity to plan and manage large-scale initiatives, and by expanding the use of public-private partnerships. In this regard, the contribution of public organisations established in the previous period is notable. For example, the Association of Technoparks developed national standards for both high-tech and industrial technoparks, and, on that basis, carried out the accreditation of technoparks and developed national rankings. Such activities increased transparency, and ensured the more efficient use of funds by state and private investors. In addition, the effectiveness of the special economic zones was assessed, after which operations in inefficient economic zones were stopped. The financing of Science Cities was also changing. In addition to basic state support

distributed on the basis of the number of residents, funds were provided on a competitive basis. In general, the regional innovation policy was shifting from a "levelling" paradigm toward identifying the most successful territories and supporting those projects with the greatest potential (Zemtsov and Barinova, 2016) .

A number of measures aimed at stimulating import substitution were also implemented. In particular, the Russian government decreed that goods of Russian origin were to be prioritised in the procurement of goods, work and services by state-owned enterprises. This decree established that foreign goods could not be procured if there was a Russian equivalent of equal quality. In 2015, the PRIORITY prize introduced. It was awarded to those Russian enterprises that achieved the greatest success in the area of import substitution. These measures were designed to increase domestic demand for high-quality, innovative, Russian products.

In order to improve the efficiency of governance and reduce bureaucracy, the Council for Strategic Development and Priority Projects (the government's project office) was established under the President of the Russian Federation. Its operations were based on project-management principles. In addition, in accordance with the principles of project management, roadmaps for the National Innovation Initiative were implemented within the project-manager functions assigned to RVC.

The key strategic initiatives of this period included the National Technology Initiative (NTI) and the Digital Economy Programme. At the end of 2014, work on the development of a set of measures for the NTI focused on identifying and supporting the development of promising Russian industries that could serve as the basis for the global economy in 15 to 20 years (Evdovina, 2015). The essence of the NTI initiative was to move from a reliance on past strengths (Phase 3) or catch-up strategy (Phase 4) to a strategy of advanced development by identifying promising global high-tech markets and establishing Russian companies that could become powerful players on those markets (Mitin, 2017).

Entrepreneurial support

By 2017, Russia's small and medium-sized businesses, which were a new economic phenomenon 25 years ago, had become an influential factor in the economy. According to the Federal Tax Service (2016) statistics, Russia was home to about 5,524,000 entrepreneurial organisations as of 1 August 2016. Of these organisations, 47% were legal entities and 53% were individual enterprises. According to the National Statistics Service (Rosstat, 2015), more than 18 million people were employed in small and medium-sized

businesses as of January 1, 2015, which represented approximately 25% of the total employment in the economy.

Table 2.19. Structure of Russia's small and medium-sized business as of 1 August 2016

Legal entities				Individual entrepreneurial organisations (IEOs)			
Total	Micro	Small	Medium	Total	Micro	Small	Medium
2,594,355	2,335,579	238,796	19,980	2,929,410	2,900,085	28,953	372
47.0%*	42.3%*	4.3%*	0.4%*	53.0%*	52.5%*	0.5%*	0.0%*

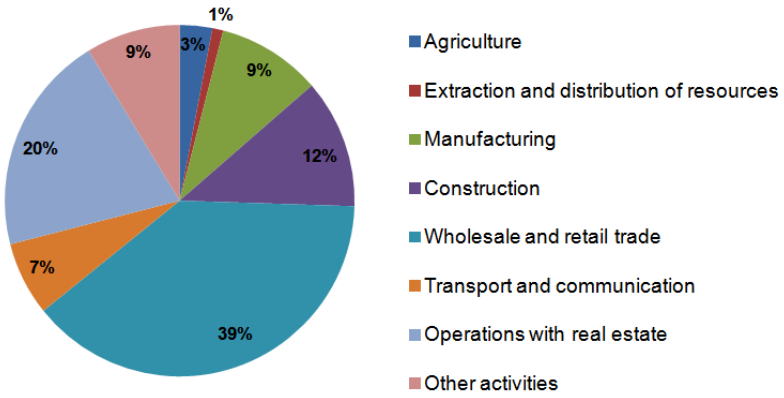
* Share of total number of entrepreneurial organisations, in %
Micro-enterprise: less than 15 people, less than RUB 120 million in gross income
Small enterprise: 16-100 people, less than RUB 800 million in gross income
Medium enterprise: 101-250 people, less than RUB 2 billion in gross income

Source: The Federal Tax Service, 2016

As of January 1, 2015, entrepreneurial organisations were dominated by individual entrepreneurial organizations (53%) (IEOs). This legal form entailed simplified bureaucratic procedures for creating and running business and paying taxes. Micro enterprises (enterprises with less than 15 people employees) constituted the majority of entrepreneurial organizations (94.8%). More than half of all people employed by SMEs worked for microenterprises or IEOs (55%; Rosstat, 2015).

According to national statistics (Rosstat, 2015), the overwhelming majority of SMEs were active in the wholesale and retail segments, and in the provision of services to the public (e.g., repairs of household goods and personal items, hairdressing services) (see Figure 2.39). As of January 1, 2015, 9% of SMEs were industrial and most companies in this category were medium-sized enterprises (RCSME, 2016).

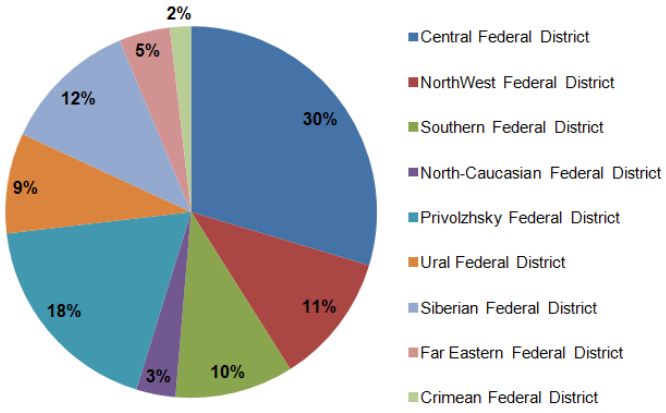
Figure 2.39. Distribution of SMEs by economic activity, as of January 1, 2015



Source: Rosstat, 2015

SMEs were unevenly distributed across federal districts. In terms of the number of enterprises and the number of people employed by small enterprises, the Central Federal District, which was home to 27% of Russia's population, was the leader (Rosstat, 2016) (see Figure 2.40).

Figure 2.40. Distribution of SMEs by federal district, as of January 1, 2015



Source: Rosstat, 2015

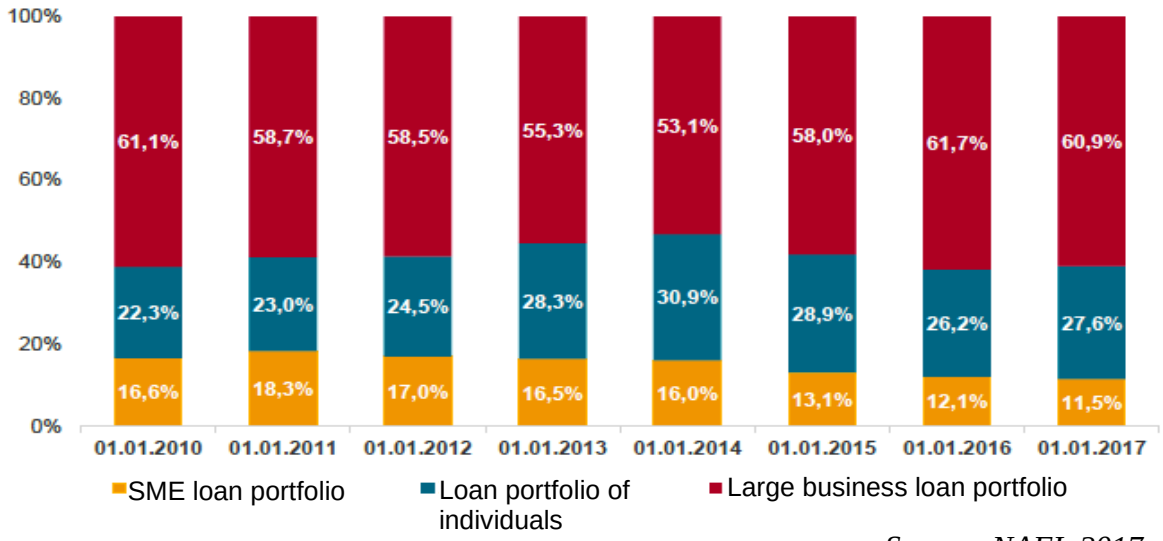
In the focal period, the development trend for small and medium-sized businesses was negative. The growth rate of SMEs decreased significantly and averaged no more than 3% per year (Federal Tax Service, 2016). This was due, in part, to the unfavourable economic situation, which caused a sharp reduction in the population's effective demand. At the same time, a number of measures were implemented in the social and economic spheres in 2014-2016, including the abolition of the tax benefit for properties held by organisations, the introduction of a trade fee, a change in the layout of non-stationary retail facilities in certain regions of Russia, a ban on trade through street stalls and an increase in pension fees. These measures led to deterioration in the conditions faced by SMEs business. More specifically, these measures, in combination with the high fiscal burden, made it difficult for early stage enterprises to grow and increase sales and profitability, and thereby ensure the transition from micro-businesses to small or medium-sized businesses (Strategy, 2016)[25].

The share of sales contributed by SMEs relatives to sales in the economy as a whole declined steadily and, on average, did not exceed 30% in the focal period (Strategy, 2016). This was significantly lower than international indicators (OECD, 2015). The share of exports from small and medium-sized enterprises relative to total exports from Russia did not exceed 6%, which was also significantly lower than international standards (Strategy, 2016). From 2014 to 2016, the innovative and investment activities carried out by small and medium-sized enterprises remained low (Rosstat, 2015), with the share of SMEs carrying out technological innovations relative to the total number of SMEs not exceeding 4.8% (Gorodnikova et al., 2017). In general, SMEs accounted for only 5-6% of total fixed assets and 6-7% of total fixed-capital investments in the country in the focal period (Strategy, 2016).

[25] Strategy of development of small and medium-sized business in the Russian Federation for the period up to 2030.

By international standards, the SMEs' usage of external financial resources for business-development purposes was unsatisfactory (OECD, 2015). According to Analytical Centre NAFI, 21% of SMEs applied for loans (mainly bank loans) in Russia in 2016. The corresponding figure for European countries was 27% (NAFI, 2017). At the same time, the share of SMEs in bank loan portfolios in the focal period gradually decreased from 16% at the beginning of 2014 to 11.5% at the beginning of 2017 (see Figure 2.41) (NAFI, 2017).

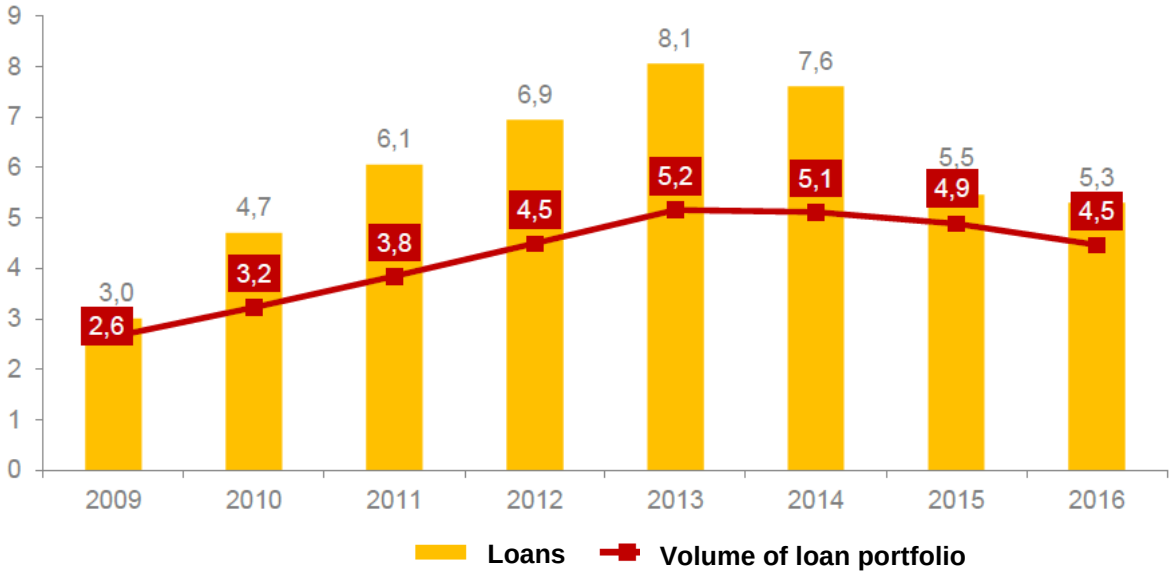
Figure 2.41. Share of loans to SMEs to total loan portfolio



Source: NAFI, 2017

In the focal period, both the volume of loans extended to SMEs and the aggregate portfolio of loans decreased (see Figure 2.42).

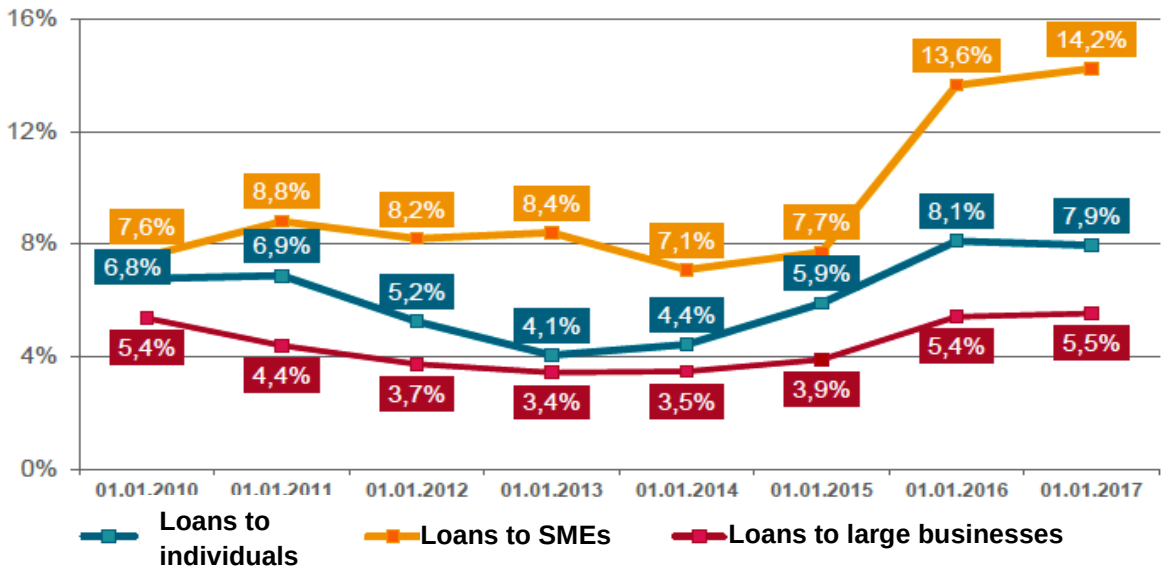
Figure 2.42. Volume and loan portfolio of SMEs, RUB trillion



Source: NAFI, 2017

As a manifestation of the impact of the general economic recession on the SMEs in the focal period, the structure of SMEs' loan portfolios changed. These changes included a reduction in the volume of short-term loans aimed at securing working capital (NAFI, 2017) and significant growth in the amount of overdue debt (see Figure 2.43).

Figure 2.43. Share of overdue loans in corresponding loan portfolios



Source: NAFI, 2017

In general, by 2017, the regulatory and legal framework for state support of SMEs had been formed. The development of SMEs, including support for self-employment and SMEs' investment potential, was viewed as a priority for ensuring the sustainable development of the economy and social stability. In order to stimulate business development and scaling, financial-support programmes were implemented in which entrepreneurs in all regions of the country could participate. Entrepreneurs could receive subsidies for business expenses, and they could obtain microloans, loan guarantees or loans on preferential terms. For SMEs, special tax regimes were provided to optimise the accounting system and tax payments. Measures were taken to expand SMEs' access to the system for the procurement of goods, work and services for state and municipal needs, as well as for the needs of companies with state participation, including the establishment of quotas for such procurement. In the regions, a network of organisations was established to provide the infrastructure needed to provide entrepreneurs with information, consulting and property support.

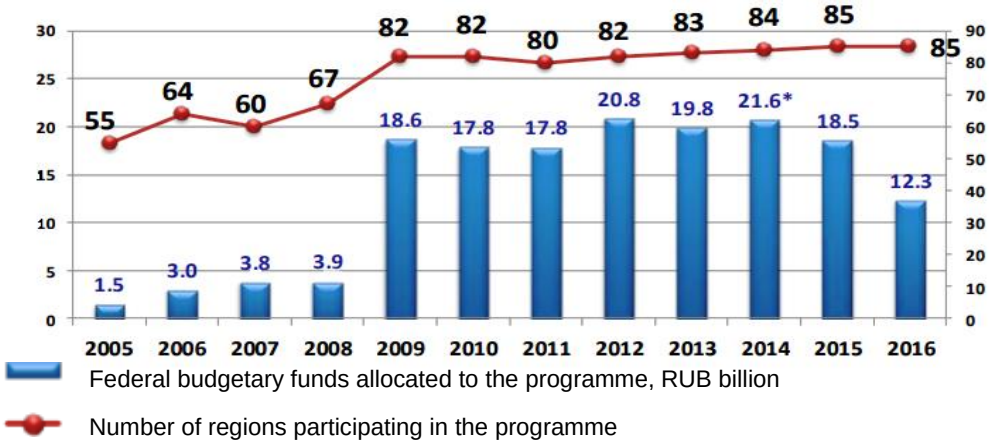
In 2015, the Federal Corporation for the Development of Small and Medium-Sized Enterprises (the "SME Corporation") was established with the goal of uniting public resources within a single structure to support SMEs and to reduce the number of

administrative barriers faced by entrepreneurs. Under the leadership of the SME Corporation, work was carried out to develop a "one-stop shop" for starting and running a business. In 2016, within the framework of the SME Corporation, an online service known as "Business navigator for SMEs" was launched. The service was designed to simplify the process of opening a new business. Anyone could register, test the demand for a new business, and estimate the payback period. One of the portal's basic functions was to provide single-point access to information about all types of federal, regional and municipal support available to SMEs as well as instruments of financial support.[26]

A number of important moves were made in the focal period, including the revision of administrative procedures related to SME regulation within the framework of the National Entrepreneurial Initiative and the introduction of a number of measures through the "Small business and support of individual entrepreneurial initiative". In 2016, the Strategy for the Development of Small and Medium-sized Entrepreneurship in the Russian Federation for the period until 2030 was adopted. This strategy served as the basis for the development and actualisation of state programmes for the development of SMEs on the federal, regional and municipal levels. Moreover, the system for collecting and analysing information on the activities of SMEs was improved. For example, the Federal Tax Service created a single register of SMEs that contained information on each entity's category as well as its types of activities, products and licenses.

In 2015, in accordance with the government's general policy of optimising spending, the overall approach to the provision of state support to SMEs began to change. Since then, the range of support tools has been broadened considerably, while the amount of funding allocated has generally declined (see Figure 2.44).

Figure 2.44. State support provided to SMEs



Source: Ministry of Economic Development of Russia, 2015

[26] http://tass.ru/msp/4109623.

As of 2015, federal funds were distributed among regions on a competitive basis. Funds were allocated for activities included in regional programmes on the condition that the expenditures were co-financed by those regions. At the heart of the new financing model was the principle of strengthening the region's responsibility for the quality of the programmes. Measures aimed at achieving this goal included a reduction in funding in subsequent years in cases of inefficient use of public funds or failure to achieve the stated goals. In case of extreme failure, a region was expected to return up to 100% of the funding and would be excluded from the financing programme in the following year.

Thus, in 2017, 82 of the 85 regions were allocated public funds for their SME support programmes. The funds totalled RUB 7.5 billion (i.e., less than in 2016; Ministry of Economic Development of Russia, 2017). The amount of funds allocated to each region was based on four indicators: the number of people permanently residing in the region; the development potential of SMEs in the region, which was determined by dividing regions into categories, taking into account the proportion of urban population living in the region and the share of turnover contributed by SMEs; the coefficient characterising the existence of internal budgetary resources in the region; and the coefficient of efficiency, which characterised the region's effectiveness in achieving its targets for its SME support programme. If certain measures were found to be ineffective in supporting SMEs, they were to be excluded from the SME support programme in the following year. This approach was designed to increase the efficiency of public-fund use, improve the quality of SME support programmes and enhance the transparency of those programmes.

Thus, in the focal period, a complex strategy was developed, and its implementation began to improve the entrepreneurial ecosystem and provide support to SMEs, among which innovative enterprises were given attention. While prioritised actions, framework measures (e.g., changes in legislation), performance indicators and coordinating structures (e.g., the Ministry of Economic Development of Russia, SME Corporation) were identified at the national level, specific support programmes were to be implemented at the regional level by the relevant federal executive bodies, taking the specifics of the development of a particular region into account. The implementation of these measures made it possible, on the whole, to improve the entrepreneurial climate, which was evident in Russia's move to 35th place in the 2018 Ease of Doing Business Ranking.[27]

[27] http://www.doingbusiness.org.

Support for R&D execution

The implementation of the previous phase's programmes, which were aimed at forming a competitive and effectively functioning sector of fundamental and applied scientific research, continued. Funding was maintained within the framework of the Russian Foundation for Basic Research, the Russian Humanitarian Science Foundation (affiliated with the Russian Foundation for Basic Research in 2016) and the Foundation for Assistance for Small Innovative Enterprises in the Scientific and Technical Sphere (the Bortnik Foundation). The annual allocation of mega grants continued and the sixth mega-grant competition was held in 2017. The grants focused on fundamental research to be carried out under the leadership of prominent scientists in Russian universities and scientific organisations. The plan was to create world-class research laboratories; derive breakthrough scientific results; solve specific problems within the framework of the Russian Federation's scientific and technological development strategies; and provide training to ensure the availability of highly qualified specialists, including young scientists.[28]

In this period, stimulating scientific and technological activities were expanded. Funding was allocated within the framework of the Russian Science Foundation, a non-profit organisation established in 2013 to expand the range of competitive research-funding mechanisms in Russia. Institutions conducting R&D could apply for grants to finance large-scale projects in the field of basic or applied research. To receive a grant, an organisation had to include young scientists in the project group and agree to allocate at least 25% of the grant towards their salaries. Moreover, in 2015, the Russian Science Foundation launched a special grant programme to support young scientists by covering expenses associated with short-term and medium-term internships, thereby contributing to the improvement of academic mobility (Gokhberg and Kuznetsova, 2016, p. 352).

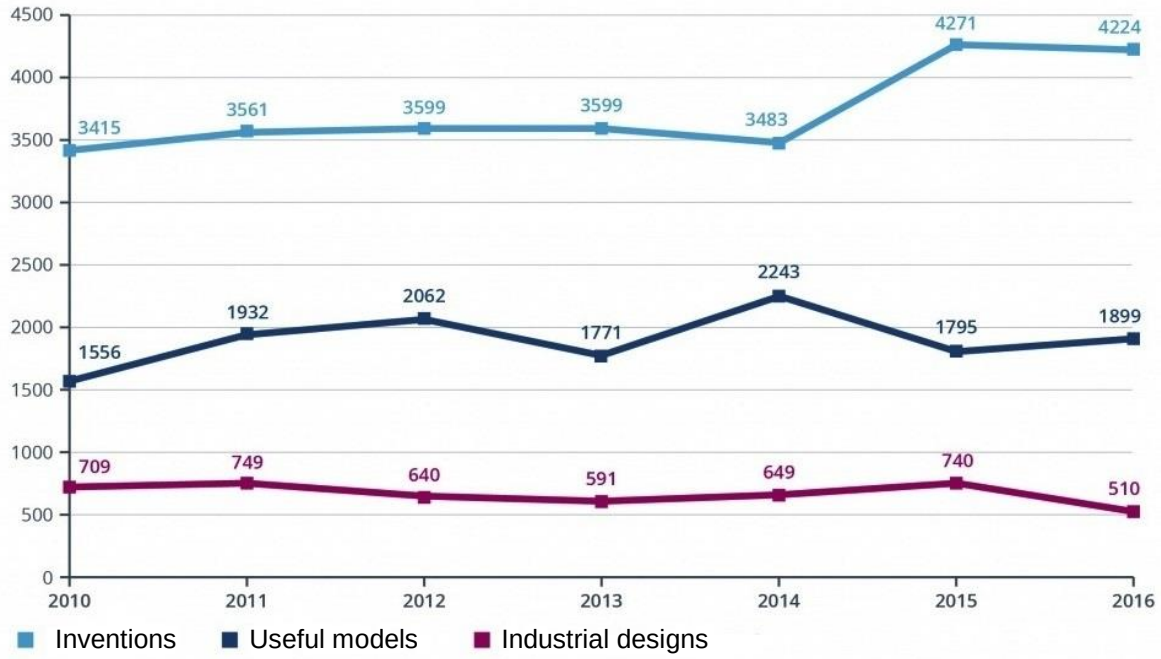
From 2013 through 2015, 15 leading universities were selected on a competitive basis to receive subsidies designed to increase their global competitiveness in both science and education (Project 5-100). The aim was to increase the prestige of Russian higher education and move at least five universities into the top 100 in the three authoritative world rankings – Quacquarelli Symonds, Times Higher Education and the Academic Ranking of World Universities – and to move the other 10 into the top 200.

[28] http://www.p220.ru/home/news/item/1261-6kmgo.

In 2014, the federal "Research and Development for 2014-2020" programme was implemented. Through this programme, the state realised its scientific and technical policy of placing state orders for research and development in those areas of science and technology that were recognised as priorities. In the second half of the focal period, these priority areas were directly tied to the technologies identified in the National Technology Initiative (NTI).

In general, the effort to intensify scientific activity had some positive results. For example, the number of publications, including research published in foreign journals, increased. Between 2013 and 2017, the number of articles published in prestigious Russian scientific journals, such as *Science*, *Nature* and the *Proceedings of the National Academy of Sciences*, increased by almost 40%, while their share was about 0.8% of the total number of scientific publications (Lichinsky, 2017). However, citations of these publications remained low compared to the average for the G20 countries (Gokhberg and Kuznetsova, 2016). In addition, in the focal period, the number of patents registered for inventions increased (see Figure 2.45).

Figure 2.45. Number of registered patents



Source: Medovnikov, 2017

Nevertheless, the number of patents for utility models and industrial designs did not rise (see Figure 2.45), which indicated a gap in the commercialisation chain despite the introduction of measures designed to create motivation and financial stimuli to ensure the transition to the entrepreneurial University 3.0 concept. This transition was viewed as the main requirement for implementation of the NTI (Bikkulov et al, 2016). On the motivation

side, an indicator of higher education-institutions' progress in establishing technological entrepreneurship, and their success in creating and developing an innovation ecosystem was introduced into the National University Ranking in 2010.[29] On the financial stimuli side, within the framework of the "Development of Science and Technology" programme for 2013-2020, grants were provided for the development of research networks, and for cooperation among universities, RAS research organisations and industry. The goal was to ensure the commercialisation of scientific developments.

By 2016, as evident in the report "Monitoring of the effectiveness of the innovation activities of Russian universities" (Bikkulov et al., 2016), there was widespread understanding of the need to foster innovative and entrepreneurial development among modern higher-education institutions in Russia as a whole. This was evident in the universities' mission statements and/or strategies. Accelerators, incubators and other elements of an innovation infrastructure have been established in a number of universities. However, only some universities have policies for the use of intellectual property. Moreover, in general, the revenues universities gain from the management of intellectual property are extremely small, amounting to an average of RUB 28,000 per year per 100 scientific and pedagogical workers. Therefore, the current scientific and educational structures do not seem to support commercialisation. Moreover, they do not appear to ensure the availability of the knowledge and skills needed to solve tasks associated with technology transfers (Medovnikov, 2017). The immaturity of Russian universities in this regard has a dual effect. First, Russia's universities have not become a source of technologies ready for transfer and commercialisation. Second, the insufficient development of this aspect of their operations means that they cannot access additional financial resources resulting from their entrepreneurial activities, which leaves the spheres of education, science and research in Russia highly dependent on state funding.

Given extant difficult economic conditions, the scientific sphere was also affected by the public spending optimisation programme, which involved the redistribution of funds to the most important areas and a reduction in inefficient spending. In the focal period, federal funding for the Russian Academy of Sciences and higher-education institutions was gradually reduced every year. These reductions primarily affected the social sciences (Alekhina, 2017; Boytsova, 2017).

[29] http://univer-rating.ru/.

At the same time, measures were introduced to stimulate the scientific sector's ability to attract extra-budgetary funds. For example, the state programme "Development of Science and Technology" for 2013-2020 required institutions to attract resources from extra-budgetary sources as a prerequisite for government funding. However, given the decline in R&D expenditures among businesses due to economic stagnation, the implementation of these measures did not affect the structure of science-related financing in Russia – the state and businesses continued to contribute approximately 70% and 30% of funds, respectively (Kiseleva, 2017). The reduction in state financing in the current economic climate, which is characterised by an unavailability of corporate-sector money for R&D and a reduction in the inflow of foreign grants due to sanctions, threatens to deteriorate the scientific base of higher-education institutions, despite significant efforts in previous periods to strengthen that base (Kiseleva, 2017). According to the Russian Academy of Sciences, the federal funds allocated to research do not correspond to the tasks the Russian president expects scientists to tackle (Rogulin, 2016). In the long run, underfunding may mean that Russia will lag its Western peers in scientific and technological areas.

Given the economic situation, the government decided to strengthen support for basic science by, for example, allocating additional funds to the Russian Science Foundation, which has been tasked with supporting fundamental research. The government also decided to support leading research institutions that were expected to serve as growth engines. However, this funding was to be provided if the institutions met international quality standards for research and effectiveness (Alekhina, 2017). At the same time, state support for applied research and experimental development was reduced, while the government worked to introduce market mechanisms to enable business to become the main customer for scientific work in the longer term (Kiseleva, 2017).

Given the focal role of the state in financing R&D, the decrease in budgetary funds may lead to the extinction of the engineering and experimental divisions among research and educational institutions, and produce an effect comparable with that seen in the post-*perestroika* period when young people ceased to be interested in science. This aspect is widely discussed in the press. It is generally recognised that the existing system of scientific development is ineffective in terms of its ability to produce commercially viable outcomes. As the state historically supported the R&D sector, people often perceived the sector as the perfect arena for achieving self-actualisation by accomplishing the goals that were of scientific interest to them rather than those that served the needs of businesses aiming for market competitiveness (Kiseleva, 2017). In the old R&D system, the

possibility that an idea that emerged from scientific research could be commercialised was viewed as a positive side effect but not a natural goal. The ability of Russian science to offer businesses a competitive, ready-to-deploy technology is still in its infancy. Despite the fact that there are some recent successful examples of business investments in R&D performed by Russian scientists, in most cases it is more convenient and cheaper to use less risky alternatives, such as buying patents and ready-made technologies often produced abroad.

The "valley of death" for Russian scientific ideas lies in the transition from laboratory research to the serial production of a product in which business is interested. The expectation that science should aim to ensure the emergence of technologies leading to new products on the market causes irritation among scientists: "We are told that we must earn through commercialisation. However, we must not be confused – science is the creation of new knowledge, while making money is the use of knowledge, which is not within our zone of competence or responsibility" (Alekhina, 2017). Scientists complain that it is difficult to move developments into production. Potential industrial partners are not interested in carrying out or financing experimental development, which leaves scientists to independently establish enterprises and search for funds for this purpose (Kiseleva, 2017). Although Russia has certain infrastructural resources to support pilot production, such as centres of collective use and design bureaus (usually in technoparks), most Russian scientists do not have the appropriate competencies to handle development themselves or attract the necessary financial resources. Moreover, they do not have the business competencies needed to bring a product to the market. In addition, Russian scientists consider commercialisation to be outside the scope of their competences and interests. In the media debate, the view that competent people should deal with commercialisation is spreading:

> The key mistake is that we do not assign the task of transferring technology to the right people. We approach young scientists and say: 'Now you are engaged in technology transfer'. Where should they run and with whom? They adopt a travelling salesman's tactic, and go to the companies and say: 'We have these technologies to offer'. However, they have no connections and no authority. As such, there is no result. We need to change this situation in both corporations and universities, and we need to orient our efforts toward people professionally involved in the markets and work with them. It seems to me that the main way to increase the efficiency of technology transfer is to reorient this work toward those people who do not just want to do it but can do it.
>
> The opinion of Alexander Povalko, who was appointed Head of the Russian Venture Company in December 2016. He had previously served as Deputy Minister of Education and Science, where he was responsible for the development and implementation of the state's strategy for the scientific, technical and innovation spheres, and for the education system (seen in Medovnikov, 2017)

In particular, some have suggested that development institutes and relevant instruments present in the Russian innovation ecosystem should play a special role in ensuring the commercialisation of scientific outcomes:

> If the research is truly market oriented, then it should be carried out together with business. If researchers do not find a direct partner in the business community, they can try to look for opportunities in the venture market. Technological entrepreneurs might invent, but then the technology should be appropriately prepared ('packaged'). In other words, scientists must be aware of the market in which they are active and formulate their strategies accordingly. True, scientists often do not know how to 'sell' their R&D results. Then they need to include promotion specialists in their teams. Of the development institutions, Skolkovo is one that copes with this well.
>
> The opinion of Leonid Gokhberg, who was the first Vice-rector, and Director of the Institute of Statistical Studies and Economics of Knowledge of the Higher School of Economics (seen in Kiseleva, 2017)

One of the initiatives taken in October 2017 – the creation of NTI Centres – was implemented within the framework of the RVC project office. The centres were designed to reduce systemic gaps among the knowledge-generation, knowledge-application, and knowledge-exploitation systems. The activities of NTI Centres are subsidised by the state on a competitive basis. An NTI Centre is a structural unit created on the basis of a university or scientific organisation, and it is designed to ensure the comprehensive development of the scientific and technical areas that have the most significance for the development of NTI markets. The work of these centres is conducted jointly with the members of the consortium on the basis of a signed cooperation agreement. The partners of universities in the consortium include industrial organisations, high-tech service companies, IT leaders and state corporations, all of which serve as experts in determining the priorities in selected areas of development and as partners in the commercialisation of technologies that emerge as a result of the centre's activities. At the end of 2017, 70 applications had been submitted from newly established consortiums in 10 scientific and technical areas, and 10 had received funding (RVC, 2018).

In the focal period, the understanding of the role of the education system in the innovation system was changing, which was reflected in a shift in focus from the production of R&D results to the training of competent people who could implement of innovative projects of interest to industry (Medovnikov, 2017):

> We need to ensure the continuity of the specialisation vertical: a secondary school student – a bachelor student – a master student – an industrial specialist. The training of specialists with the direct participation of industrial customers will enable us to comprehend new directions of scientific development in relation real-life practices at production sites, thereby enabling young people to grow and participate in real processes.
>
> Opinion of Olga Uskova, who was the President of Cognitive Technologies, and President of the National Association of Innovation and Information Technology Development. (Uskova, 2017)

In order to support the transformation of the scientific and educational potential into concrete results, new initiatives emerged in the field of education. These initiatives were implemented within the context of the federal programme on the Development of Education for 2016-2020. The initiatives included the implementation of a new bachelor's degree framework known as the applied bachelor in which at least 20% of academic time was to be used for internships in companies; the introduction of entrepreneurship-, technology-transfer and commercialisation-related disciplines in master's of engineering programmes; and the implementation of a strategic initiative entitled "New model of the system of additional education of children", which included the development of a system for engineering and entrepreneurial education at the secondary-school level (e.g., a network of science and technology parks for children, known as Quantorium).

Commercialisation infrastructure

The main efforts to develop the commercialisation infrastructure in this phase focused on increasing the efficiency of the Russian NIS, developing technological entrepreneurship, and introducing incentives aimed at increasing innovation activity in the scientific community and among large, state-owned companies.

In order to improve the efficiency of the NIS, the initial results of actions taken in the previous phases, many of which were spontaneous and situational, were analysed. Consequently, a methodology for evaluating the activities of high-tech and industrial technoparks was developed by 2015. In 2015, several high-tech technopark projects were selected for inclusion on the list of entities eligible for state support. These institutions were reimbursed for the costs incurred while creating the parks' infrastructure.[30] In 2016 and 2017, the effectiveness of the special economic zones was assessed, as were the results of the implementation of the regional innovation policy. These assessments resulted in a change in the way financing was provided, such that funds were thereafter allocated on a competitive basis to projects with the greatest potential. Moreover, the use of public-private partnerships was expanded. At the same time, an analysis of the university ecosystem was carried out by the High School of Economics. The best experiences were consolidated in a report prepared by RVC together with the High School of Economics Business Incubator entitled "Methodological recommendations for improving the efficiency of business incubators and accelerators" (RVC and HSE, 2017). In general, the focal period brought a change in the approach to providing state support to actors in the innovation infrastructure. More specifically, there was a transition from the allocation of

[30] http://minsvyaz.ru/ru/activity/directions/445/.

funds to activities focused on the implementation of certain NIS development measures towards reimbursement (on a competitive basis) for actual costs incurred (Zemtsov and Barinova, 2016).

In 2014, the National Technology Initiative (NTI) was launched to enhance the effectiveness of innovation through the creation of a single space in which the interests and efforts of business and science could converge. The first stage of the NTI's implementation was the development of the NTI matrix, which combined the key concepts of markets, technologies, infrastructure/resources and institutions.

Promising high-tech markets were identified based on the foresight methodology. Most of the measures introduced to help Russia achieve leadership in new markets were formulated by businesses within the framework of working groups, which aggregated the efforts of business, scientific and educational communities, as well as those of public authorities and other stakeholders. The working groups were headed by reputable technological entrepreneurs – professionals in relevant thematic areas and deputy ministers of relevant bodies of the federal government (NTI, 2017[31]).

The roadmaps were submitted to the government for consideration and approval. They included activities to: create, develop and promote advanced technologies, products and services that would ensure Russian companies leading positions in the emerging global markets; gradually improve the regulatory framework; improve the education system in order to develop the staff needed for dynamically developing companies, and for scientific and engineering teams involved in the creation of new global markets; monitor and update the roadmaps using foresight methodology. Each NTI market was assigned a title ending in *-net* to emphasise that it would be fully imbued with information and communication technologies representing an intelligent network based on IT solutions, including measurement, control and decision-support systems (Borovkov, 2016). After launching the NTI initiative, 12 markets were identified (see Table 2.20).

Table 2.20. NTI markets

NeuroNet	The market for human-machine communications based on advanced developments in neurotechnology aimed at increasing the productivity of human-machine systems, and enhancing mental and thought processes
AeroNet	The market for unmanned aerial vehicles and related services
MariNet	The market for marine intellectual systems; market segments: digital navigation, innovative shipbuilding, technologies for the development of ocean resources
AutoNet	The market for unmanned vehicles based on the development of sensory systems, and software for recognising road scenes and managing road transport

[31] http://www.nti2035.ru/nti/.

HealthNet	The market for personalised medicine; market segments: IT devices and platforms to support health and treatment, sports health, preventive medicine, new medical materials, bio-prostheses, artificial organs, personal pharmacological drugs, prevention and treatment of aging
EnergyNet	The market for technological solutions that ensure the intellectualisation and distributed nature of power grids (smart grid)
FoodNet	The market for the intellectualisation, automation and robotization of technological processes throughout the food-product lifecycle from production to consumption, as well as the development of biotechnologies
SafeNet	The market for new personal security systems; market segments: secure communication channels (including those based on quantum communications), verified operating systems with enhanced security and applications, biometric authentication systems, other areas
FinNet	The market for decentralised financial systems and currencies. Financial settlement systems were expected to play a key role in increasing the efficiency of financial transactions in new markets. Due to the increasing number of payments, the financial settlement systems were expected to become increasingly decentralised.
MediaNet	Market for high-tech methods of consuming content
TechNet	Cross-market and cross-sectoral direction focused on providing technological support for the development of NTI markets and high-tech industries through the formation of the digital, smart, virtual factories of the future
FashionNet	The market for the fashion industry and textiles focused on innovative design methods and new materials

Source: ASI, 2016[32]; Mitin, 2017; NTI, 2017[33]

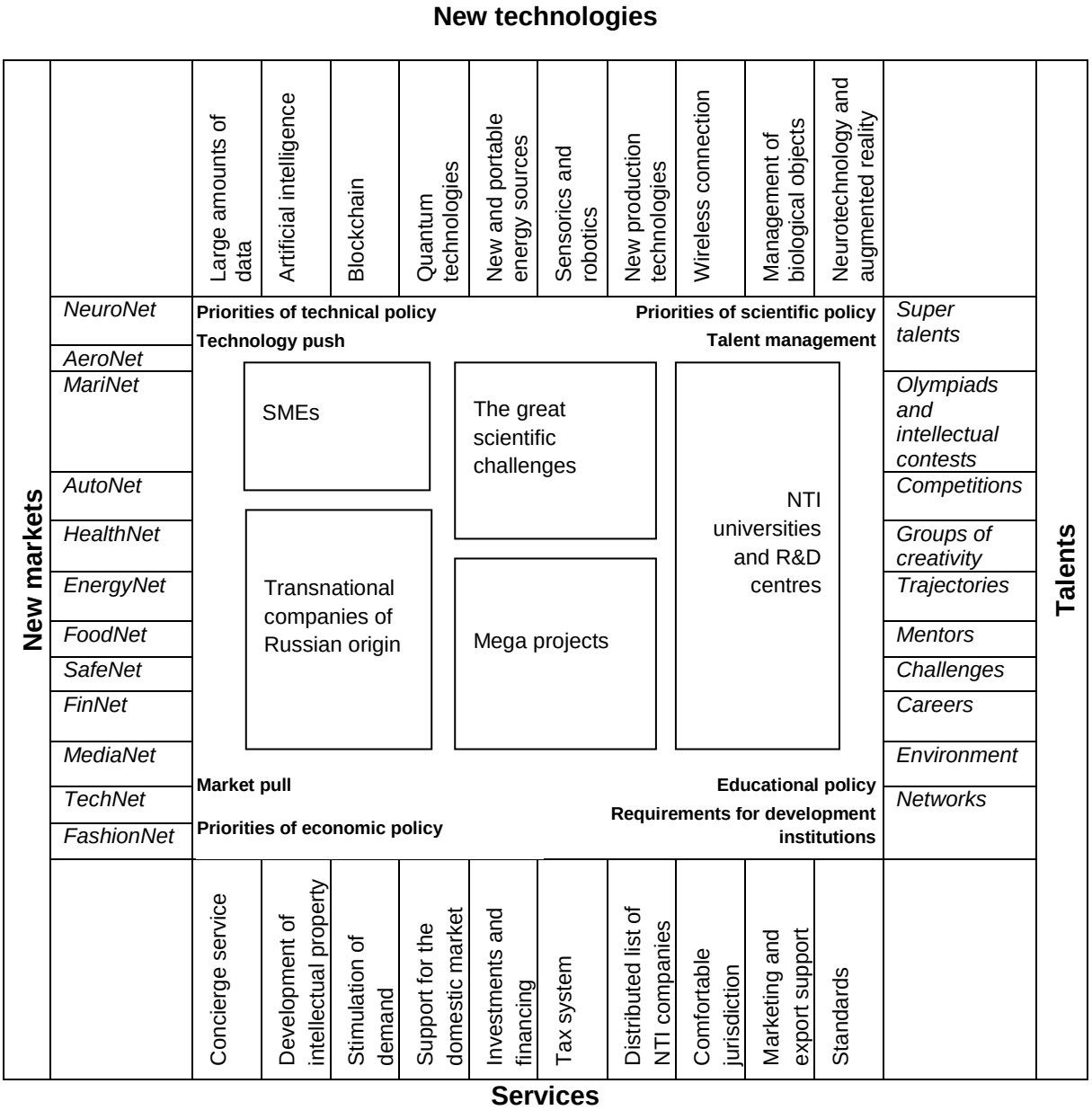
Unlike the technology push approach that was applied in the earlier stages of Russia's NIS development, the NTI goal was more ambitious: to create a mechanism that would link the overarching problems of the country's economic development with the high-tech markets, the chosen technological priorities and the mechanisms for their implementation. Therefore, the efforts to identify key NTI markets led to the identification of core scientific and technical areas that were expected to have the most significant effects on the development of those markets. In particular, technological barriers were identified and then formulated as lists of R&D and engineering issues that required solutions for the development of certain markets.[34] Moreover, the identified NTI markets and technologies determined a meaningful focus for governance initiatives, and led to the introduction of programmes centred on development of the innovation infrastructure and the resource base, as well as measures to support scientific and commercialisation activities.

In fact, the NTI matrix (see Figure 2.46) offered a vision of the strategy and logic behind the building of a new national innovation system in Russia. It aligned the efforts of all NTI participants to achieve the goal of creating a progressive, highly technological economy in Russia that did not chase the leaders but was the leader in certain markets. The purpose of the NTI was to stimulate the emergence of new transnational companies of Russian origin,

[32] https://asi.ru/news/59773/.
[33] http://nti2035.ru/markets/.
[34] http://nti2035.ru/technology/.

which could grow rapidly by entering global markets while retaining their R&D and taxation centres in Russia. In that sense, the NTI represented a response to the exponential growth in technology, which carried both endless possibilities and significant threats for economic development. The NTI provided for a completely new vision of managing the country's innovative development. As a concept, it embraced the vision, the system, the project and the ideology. From a tactical point of view, it was an innovative project consisting of a large number of iterations aimed at continuously testing those hypotheses that were put forward (Pushkash, 2016).

Figure 2.46. NTI matrix as a new model for Russia's NIS



Source: NTI, 2016[35]

[35] http://www.nti2035.ru/matrix/.

The NTI concept is based on digitisation. At the same time, according to BCG (Banche et al., 2016), Russia is lagging five to eight years behind the leaders in the digital economy and this gap will rapidly increase without strategically balanced actions. At the beginning of 2016, estimates indicated that the digital economy in Russia contributed 2.1% of GDP, which was 1.3 times more than in 2011 but was still three to four times less than in the leading countries (Banche et al., 2016). In terms of overall digitisation, Russia's inherited dependence on foreign hardware and software was a strategic problem that posed a potential threat to the development of the Russian economy. To address this vital domain, the government introduced an initiative aimed at developing the digital economy. Within the framework of that initiative, a number of actions were undertaken. In 2015, work began on identifying priority projects for the development of information and computer technologies (ICT). Moreover, the need to establish an Information Technology Development Fund (ITDF) to provide financing was discussed. In the absence of funding resulting from public budget constraints in the stagnant economy (Trukhanov, 2016), the ITDF was not established until January 2017. The main objectives of the ITDF were to support scientific and technical activities in the ICT field, to promote the products and services of Russian IT companies in domestic and foreign markets, to support ICT-related import substitution, to train IT personnel, to popularise industry achievements, and to stimulate the prestige of IT careers (Kolesov, 2017). The ITDF was also expected to be engaged in the analysis of ICT sector and to coordinate investments made by innovation-development institutions.

By 2016, an understanding emerged that the underdevelopment of technological entrepreneurship and the immaturity of market mechanisms represented serious barriers to commercialisation. This led to the active renewal of the state policy instruments applied in the fields of innovation and technological activity. In this regard, the efforts of development institutions in 2016-2017 focused on expanding the range of projects aimed at the strategic development of the regional innovation ecosystem; supporting innovative clusters and technological start-ups by, for example, creating incentives for the establishment of corporate accelerators and stimulating the development of open-innovation tools; creating and developing the ecosystem for venture financing for technology companies; supporting technological entrepreneurship; developing technology-transfer mechanisms and creating an efficient service infrastructure to support such transfers; and motivating investors to be active in different stages of the globalisation of the Russian innovation industry. The latter was implemented by establishing partnerships with international players in the innovation and venture ecosystem; promoting Russian

technology companies in foreign markets through government and business fora; and providing services to help Russian projects enter foreign markets (RVC, 2016).

In order to encourage technological entrepreneurship in the focal period, the "TekhUspech" rating was developed to identify successful high-tech companies. In 2016, based on the data obtained while compiling this rating, the Ministry of Economic Development of Russia began to implement the priority project "Support for private high-tech leader companies" (National Champions), which had a planning horizon extending through the end of 2020. The project aimed at ensuring rapid growth among domestic, private, high-tech, export-oriented companies that were leaders in development, and the emergence of Russian multinational companies. The project was expected to provide assistance in accessing government support instruments, including those available through the framework of development institutions, and to offer information and consulting services with the goal of developing companies' domestic and international activities (Innovation.gov.ru, 2016).

In addition, the Russian Export Centre[36] was created in the focal period with the purpose of supporting entrepreneurship. The centre was designed as a specialised, one-stop-shop for exporters. It provided financial and non-financial support, interacted with relevant ministries and agencies, and carried out functions related to the development of foreign economic activity. Moreover, with the aim of expanding the range of available, financial instruments, the Industrial Development Fund[37] was established in 2014. The fund offered preferential conditions for co-financing projects aimed at the development of new high-tech products, modernization, and competitive production processes.

As the venture capital market shrank in 2016 and 2017 (RVC, 2016), the main priority was to revitalize the innovation activities of state-owned corporations, and helping those corporations build relationships with university ecosystems. In October 2016, RVC began implementing the "Development of Innovative Clusters" project, which involved the provision of methodological, organisational and expert analytical support to NIS actors, including the innovative territorial clusters that had been selected as participants in the Ministry of Economic Development's "Development of innovative clusters – world-level leaders of investment attractiveness" project.[38]

[36] https://www.exportcenter.ru/en/.
[37] http://idfrf.org/.
[38] https://www.rvc.ru/eco/p2/development_partners/87756/.

The activities of the institutions involved in promoting technology transfer were stepped up in the focal period. In addition to the Russian Technology Transfer Network (RTTN),[39] which was established in 2002 to allow for dissemination of technological information and the selection of partners for innovative projects, several new players emerged. These new players actively searched for technologies and industrial customers that might be interested in those technologies. As such, they acted as technology brokers. They included the Association of Innovative Technology Brokers (ABIT),[40] established in 2016, and the National Association for Technology Transfer (NATT), which was established in May 2017 by the Federal Service for Intellectual Property (Rospatent) and the non-governmental development institute Innopraktika.[41] ABIT was focused on the overall development of technological brokerage through the promotion of comprehensive assessment methods and the development of technology projects. As such, it created the common methodology needed for transparent technology transfer in the NIS. ABIT positioned itself as a group of knowledgeable experts to whom the scientific community could entrust the commercialisation of its projects on certain terms, which included commission fees and a share in the project. Notably, ABIT also developed a joint educational project with the Foundation for the Development of Internet Initiatives. Within the framework of this project, representatives of higher-educational institutions were to learn technology-transfer methods for implementation in their universities. NATT was more focused on technologies requested by large, state-owned companies. It could enter into service contracts with those companies through the existing administrative resources of Innopraktika.[42]

Information and transparency

In the focal period, the active development of the Russian NIS's web infrastructure continued. A number of useful online information systems offering free access were launched, including the SME Business Navigator; a register of the results of R&D and civil engineering work carried out with the support of federal funds; an SMEs register; a geoinformation system of industrial parks, technology parks and clusters; and an information-support platform developed by the Leadership Development Institute (Leader ID) aimed at consolidating human resources for the implementation of innovative projects.

[39] http://www.rttn.ru/index.php/about-the-network.
[40] https://www.abit-russia.com/o-nas.
[41] https://innopraktika.ru/news/770/#sthash.d98F6BJT.dpuf.
[42] http://www.newsru.com/russia/07jun2017/tikhonova.html.

As a result of the focal phase's efforts, information about any Russian NIS project or infrastructural organisation can now be easily obtained through the internet. All competitive procedures, including federal and development institutions' contests and projects aimed at supporting fundamental and applied research, are carried out electronically. The information can be accessed from almost all regions of Russia, which ensures equal opportunities for all participants in the innovation system. Moreover, an Open Government project [43] is being implemented. The project aims to ensure the transparency of decisions and activities of the federal executive bodies. The Open Government project is designed to improve the institutions of civil society, and ensure the interaction of Russian government bodies with public associations, movements and expert organisations. In addition, one-stop-shop projects on interacting with government agencies have been introduced for both SMEs and individuals. However, most of these internet resources are only available in Russian.

Implications for innovation and networking

In general, activities in this phase aimed to improve the effectiveness of the Russian NIS, which had been formed in the previous stages but was an inefficient, incomplete, chaotic and uncoordinated system. Despite the fact that much of the NIS had already been formed by the beginning of this phase, visible effects in terms of the use of innovation as a driver of economic development had not been achieved. In addition to the problems related to the slow maturation of market mechanisms conducive for innovation, a new challenge arose in this period – the need for innovation development in the face of the financial constraints caused by the decline in oil prices, the general stagnation of the economy and the international sanctions, which also severely restricted Russian companies' access to foreign technologies and markets. Notably, although the presence of financial constraints posed a threat to the NIS's development given the dominance of public resources in the R&D sector, many experts viewed the pressing need for import substitution caused by the sanctions as a powerful external incentive for large Russian state-owned corporations to introduce innovative technologies. As such, these corporations were motivated to search for technologies in the Russian market and to invest in their development despite the limited availability of resources.

With regard to building links in the Russian NIS, the state changed its strategy in response to the economic and political challenges, and the budgetary difficulties arising from sanctions and the implementation of large-scale projects (e.g., the Olympic Games in

[43] http://open.gov.ru/.

Sochi, the integration of Crimea, the war in Syria, the World Cup). In the fourth phase of development, the state's efforts were mainly focused on ensuring the emergence of the necessary institutions and on building vertical links in the NIS (see Figure 1.15), while leaving a significant amount of space for others to experiment and undertake various activities to build a wide range of horizontal links. Public funds were provided to various projects that contributed to the emergence of internal links in the NIS. In the fifth phase, the state acted as a catalyst for and integrator of NIS participants' activities. In this role, it streamlined informational, material and financial flows, and provided financing on a competitive basis, mainly subject to private co-funding. In this regard, the state generally reimbursed costs already incurred for projects, the implementation of which led to positive effects.

In the focal period, a new NIS structure was proposed, which is designed to allow for the alignment of NIS actors' efforts and to create a new vision of the purpose of innovation. This approach relies on the identification of new market opportunities within the framework of an NTI project and it is centred on the development of markets of the future, the emergence of which will require new technologies. Therefore, this approach constitutes the Russian interpretation of the "market-push" concept – it is not based on the needs of today's markets but on the vision of new, currently non-existent or newly emerging markets that will require breakthrough innovations. In this sense, the NTI matrix (see Figure 2.46) represents a new model of the Russian NIS. NTI includes a complex set of projects and programmes, as well as action plans ("road maps") to promote the development of promising markets based on high-tech solutions that will determine the development of the global and Russian economy in 15-20 years. A distinctive feature of NTI is that the action plans for ensuring Russia's leadership in new markets are formulated by the hi-tech business themselves. The realisation of "road maps" occurs by launching concrete NTI projects, which are implemented on the basis of public-private partnerships. The NTI concept unifies all Russian NIS participants' activities and integrates the development instruments that existed earlier. For example, as of 2017, the allocation of funding for R&D and start-up acceleration programmes, such as GenerationS, reflected the key areas identified within NTI.

The main government efforts related to the NIS in this phase focused on the top two layers of the innovation pyramid (see Figure 1.18): stimulating the development of the innovation environment and finding new financing mechanisms. In this period, most direct federal funding was replaced with measures aimed at stimulating investments through regional

budgets and private capital. The intention was to provide preferential terms for federal funding with respect to obtaining coverage of the costs incurred by those regions that actively invested in the development of innovations. There was also a shift from the homogeneous distribution of federal budget funds to NIS actors towards the provision of selective support for those projects in the spheres of R&D and NIS infrastructure development that promised maximal effect.

In this period, there was a fairly significant change in the instruments used for NIS development, especially after 2016. The new centre of attention manifested itself in the transition from stimulation of a venture-capital market and augmentation of the number of start-ups to stimulation of the demand for innovation among corporations, and of the growth of small and medium-sized technology companies to enable venture-capital exits. The involvement of corporations in innovation development is now realised through the creation of new corporate accelerators, which aim to support technological start-ups that carry out development useful for solving the technical problems facing businesses. Some businesses are actively involved in selecting and working with start-ups in existing programmes and innovative projects (e.g., GenerationS) in order to increase the possibility of attracting corporations as strategic investors and, thereby, provide venture investors with exit possibilities. This might also indirectly contribute to the development of the venture-capital market through the emergence of opportunities for profitable exits of venture investments. However, given the unstable geopolitical situation, the perception of heightened investment risk and the depletion of the pool of attractive start-ups, this beneficial side effect can only be achieved very slowly. After the constant decline that began in 2013, the venture-capital market showed growth for the first time at the end of 2017, when the total capitalisation of venture-capital funds increased by 8% compared to the previous year, and reached USD 4 billion (RVC, 2018). At the same time, the task of stimulating the development of technological entrepreneurship and the emergence of new start-ups did not completely disappear from the Russian NIS's horizon. However, responsibility for this task moved to the regional and university level.

The introduction of the NTI approach is an essential step in establishing strong and meaningful links among the knowledge-generation, knowledge-application and knowledge-exploitation subsystems of the NIS. The joint development by scientists and businesses of activities included in the roadmaps will help bridge the gap between the scientific sector, which has been accustomed to carrying out fundamental and applied research that corresponded to researchers' own interests, and businesses, which has

sometimes struggled to formulate clear tasks for scientists in terms of developing relevant technologies.

The need to develop a new systemic solution (the NTI approach) and to implement the numerous measures aimed at improving the effectiveness of the NIS instruments and institutions described in this section required an analysis and critical evaluation of the effects of decisions made in previous phases. The main effects of those decisions included the following. First, activities previously undertaken to develop the venture market, innovation infrastructure and multidirectional projects aimed at stimulating the emergence of start-ups did not result in a significant number of companies that could compete at the global level. Moreover, the few relatively mature private Russian companies that were financed by state funds in their early development stages moved to foreign jurisdictions where it was easier to find the funds necessary for development at later stages. These markets were also characterised by fewer geopolitical risks and higher demand for innovation. Consequently, the focus on finding and supporting an increasing number of technological teams to create new start-ups no longer worked given the decline in the number of technologies ready for commercialisation. Therefore, a new systematic approach was needed to ensure the emergence of start-ups in Russia, especially in light of the positive prospects for business development in newly created markets.

Second, the prevailing conditions did not allow for the organic development of venture mechanisms for a number of reasons. There was a lack of private funds available for investment in the Russian NIS. The business-angel market was growing slightly, but this did not solve the systemic problems associated with venture-market development, as there were no funds available for later stages. The financial resources allocated in funds' initial investment rounds had not yet resulted in enough returns to allow for re-investments. In addition, large companies did not actively use open innovation and were generally not interested in becoming strategic investors. Moreover, there were not enough exits to prove that investments in the Russian venture industry were economically justified and, thereby, attract new investors. The imposed sanctions, economic stagnation and uncertainties in the Russian market led to an outflow of foreign investors, which reduced the availability of long-term financial resources, which were already severely limited. The restrictions on the abilities of pension funds and insurance companies to undertake risky venture investments also restrained the emergence of long-term financial resources that could revitalise the market. As result, the volume and size of venture deals declined, and the conditions start-ups faced when attempting to obtain venture funds became more complicated. In an effort

to reduce risks, private funds carefully assessed the quality of start-ups and demanded highly detailed information on projects. Today, venture capitalists often select more mature projects for investment than they did in previous stages of NIS development. As such, state grants and business-angel funds are becoming the primary source of start-ups' financing in their early stages. However, this may not be sufficient to create a steady flow of new start-ups, which could lead to a further reduction in the venture market. Thus, venture-market mechanisms have not become a natural growth engine for technological entrepreneurship, which has made it necessary to search for other drivers of growth.

Third, the use of public funds as the key resource for NIS development has had serious drawbacks. On the one hand, development institutions and regional authorities that received public funds had an incentive to use them, but not necessarily in a way that was effective. This led to the inefficient use of funds, including the implementation of expensive, inexpedient projects that did not result in the desired outcomes. In particular, the problem of identifying and growing promising start-ups remained unresolved and funds often went to projects that failed. The press constantly accused state development institutions of misusing public funds.[44] However, the occurrence of errors was inevitable given the absence of a sufficient number of high-quality start-ups, the lack of experience among both development institutions and entrepreneurs, and the lack of fully defined selection criteria,. On the other hand, in the opinion of venture-market representatives, the flow of government funding and the relative ease with which start-ups could obtain grants (albeit small in volume) led to systemic errors, including the distortion of entrepreneurs' motives (Andrushchak et al., 2018). Some entrepreneurs turned into "grant eaters" who extracted profits not by bringing their products to the market but by repeatedly receiving and using grants. Such grant eaters mastered the skills needed to obtain these grants (Grishin, 2014). In the venture community, there is a firm belief that it is impossible to deal with entrepreneurs who have received several state grants, as they are not sincerely committed to working hard to commercialise their ideas or technologies (Andrushchak et al., 2018). Thus, the dependence of the Russian NIS on public funding and the uncontrolled, incompetent spending of public funds by state officers were dangerous, as it made the development of the system unstable. In other words, development progressed only as long as the flow of funds continually increased. Therefore, it was necessary to ensure that business representatives shifted from their position as external stakeholders in

[44] Despite the significant benefits of such development institutions as Skolkovo, RVC, Rosnano and Innopraktika, their activities have repeatedly been accompanied by corruption scandals and suspicions of unauthorised use of entrusted resources (e.g., Rashidov, 2012; Internet portal Meduza publications, 2014-2017).

the NIS's development to actors who were involved in decision making and shared responsibility for the results, including financial responsibility, as intended in the NTI approach.

The analysis carried out in this study highlights a number of strengths and weaknesses inherent in the current state of the Russian NIS (see Table 2.21), most of which are directly related to the opportunities, threats and risks associated with interactions between entrepreneurs and NIS actors.

Table 2.21. Analysis of the strengths and weaknesses of the Russian NIS as of 2017

Strengths	Weaknesses
• Integrating the vision for the development of the innovation system (NTI matrix) • Restored intellectual capital; revitalised scientific schools and the scientific community • Interest in science and technological development among young people • Educated workforce • Existence of fundamental layers of innovation development, including the basic social conditions, conditions supporting the emergence of R&D and a framework for entrepreneurship (including relevant regulations) • The innovation system in general is built, i.e., the presence of key players and mechanisms for their interaction • Opportunities for networking • Wide internet-based provision of information on possibilities for innovative development and entrepreneurial support • Presence of a competent innovative community • Access to acceleration programmes ('innovation lift') and entrepreneurial education • Recently improved methodology for provision of financial support to NIS actors by the state	• Unfavourable geopolitical situation and high volatility in the economic environment, which aggravate the risks associated with investing in the Russian market • Dominant role of the state in the NIS's creation, development and governance • Undeveloped methodology for assessing the effectiveness of the NIS in order to rapidly identify problems and redistribute resources • High dependence of NIS development on public funding • Lack of demand for innovations from business • Lack of an innovative infrastructure that can function in market conditions • Disintegration of the innovation infrastructure due to poor technology transfer element in the commercialisation chain • Lack of horizontal links and mechanisms to ensure effective commercialisation, including mechanisms for international cooperation • Lack of private financing for innovation in Russia • Underdeveloped venture market and lack of risk financing • Reduction in investments in innovative development by businesses owing to economic stagnation • Decline in entrepreneurial activities as a result of economic stagnation • Underdevelopment of technological entrepreneurship (lack of critical mass) • Lack of trust among NIS actors • Lack of an entrepreneurial culture and commercialisation-related skills among researchers and inventors • Differences in the cognitive frameworks and motives of NIS participants: scientists, inventors, entrepreneurs, venture capitalists and representatives of development institutions • Concentration of innovative activity in few Russian regions and uneven development of the regions

Source: Developed by the author

Thus, as of 2017, the positive factors contributing to entrepreneurs' networking behaviours were the existence of easier access to information than in the previous period owing to the development of communication media; the availability of a variety of educational and acceleration programs; and the wider development of opportunities to obtain support on a regional basis. The factors that created certain barriers included general professionalisation of relationships in the innovation system and, due to the limited financial resources and the desire to avoid risks, the adoption of more conservative behaviours among NIS participants, including in interactions with other actors. Consequently, stricter requirements were imposed on start-ups with reference to the level of professionalism and the degree of a project's thoroughness. In addition, the costs associated with interacting with development institutions were increasing. These institutions became less open to interaction, and tried to switch to market relations by providing advice and services on a fee basis with the aim of ensuring their own self-sufficiency. At the same time, opportunities to obtain financing, especially in the early stages, were reduced, while the bureaucratisation of the grant process increased.

Given the reductions in the resources available to entrepreneurs in the Russian NIS, purposeful and systematically organised networking (rather than the chaotic forms of networking seen in previous stages) has become particularly important. Andrushchak et al. (2018) indicate that in the context of today's more structured environment, the links among key NIS actors are less diverse, denser and related to the sphere of professional specialisation where the level of trust among the participants is a priori higher. This has certain positive aspects, as such interactions lead to more meaningful, deep and lasting relationships. At the same time, however, this localisation of cooperation, especially in the context of persisting cognitive gaps in the views of various Russian NIS actors, does not broaden the vision of development horizons, and can lead to underestimations and omissions of opportunities to advance innovation. Assumptions about how actors in the Russian NIS actually operate within the framework of the newly established system require empirical verification.

2.4. Specific features of the Moscow RIS

As discussed in Section 1.3.4, factors related to the development of the RIS influenced companies' business decisions, which may have led to the creation of both opportunities and threats. As the purpose of this study is to assess the implications of company-internal factors, such as innovativeness, on networking behaviour, it is necessary to consider companies that conduct business in the same region and are, therefore, influenced by the

same external factors. Moscow was chosen as this region based on the following arguments. First, Moscow was historically the first region to be involved in the development of the Russian innovation system. Second, Moscow's regional innovation system (RIS) is well developed in terms of the existing infrastructure, the presence of all groups of RIS actors, the demand for innovative products, and the existence of RIS governance systems and structures. Third, numerous forums and conferences in the field of innovation, at which it is possible to meet representatives of all key groups of NIS and RIS actors, are regularly held in Moscow. Therefore, for this study, the Moscow RIS is the optimal environment, as it provides firms with numerous opportunities to network and establish links with actors in the Russian innovation systems.

As the Russian capital, Moscow is at the centre of all political, economic and communication processes in the country. In particular, Moscow serves as the coordinating centre for the development of the Russian innovation system and as a platform for the implementation of a large number of pilot infrastructure projects supportive of innovation. All committees, ministries and development institutions mentioned in this chapter (e.g., RVC, RUSNANO, Skolkovo, IIDF) are located in Moscow. In this regard, Moscow-based companies were among the first in Russia to have access to infrastructure projects and information flows starting with the third phase of development.

In addition, Moscow is a highly economically developed region with a well-formed regional innovation system. According to recent data (as of 2015), Moscow ranks second in the complex Russian Regional Innovational Development Ranking (Gokhberg, 2017). It places first in terms of "socio-economic conditions for innovation activity", and fourth in "scientific and technical potential" and "innovation activity". In 2015, experts have criticised Moscow for the low quality of innovation policy owing to the underdeveloped regulatory framework, the undeveloped structures for the implementation of innovation policy, and the low level of budgetary spending on science and innovation (Gokhberg, 2017). However, efforts in recent years have led to significant progress in problematic areas (Plieva, 2017). To ensure the effectiveness of the implementation of innovation policy, the Centre for Innovative Development of Moscow was created in 2012. The Centre’s functions were transferred to the Moscow Agency of Innovation[45] in 2016 by decision of the Department of Science, Industrial Policy and Entrepreneurship of Moscow (Plieva, 2017). As of 2018, the Moscow Agency of Innovation acts as a system operator for the Moscow innovation ecosystem. As such, it plays the role of a "single window" for all participants. The Agency’s main aims are to develop the region's innovation infrastructure; to coordinate the implementation of public-private projects in the field of

[45] www.innoagency.ru.

innovation in Moscow; to support market access for high-tech companies; to assist in the development of special services for innovative companies, industrial urban structures and young people interested in science, innovation and modern technologies; and to popularise the capital as a digital city and a full-fledged participant in the global market.

According to business experts who took part in the Smart City Expo World Congress in Barcelona in 2017, Moscow's innovative infrastructure is one of the most attractive for the development of innovative production (Kommersant, 2107). The Internet-based information system "Navigator of Information in the Capital"[46] provides information on the Moscow RIS's infrastructure (see Table 2.22), opportunities and terms of interaction. It also provides information on available financing, office and production space available for rent, technological and educational services, and Moscow-based programmes and activities (including those supported by the regional funds) for entrepreneurs interested in business development.

Table 2.22. The Moscow RIS's infrastructure (number of each type of organisation)

Knowledge-generation and diffusion subsystem	
Research organisations	***Educational organisations***
737 Scientific and research organisations 98 Unique scientific platforms (centres with unique scientific equipment for collective use) 20 Engineering and prototyping centres 6 Nanotechnology centres 274 Metrology centres 463 Certification bodies and testing laboratories	47 Higher-education institutions with engineering and technical specialisations 43 Colleges of engineering and colleges with a technical orientation 68 Centres for youth innovation 12 Technoparks for children More than 500 technological and engineering courses and programmes offering additional education for children
Technology-mediating organisations	***Support organisations***
33 Technoparks (status approved by the Association of Technoparks) 14 Technoparks (status not yet approved by the Association of Technoparks) 1 Special economic zone "Technopolis Moscow" 3 Technology-transfer centres 134 Centres for the collective use of technological equipment	13 Development institutions (public and private) 11 Business incubators 6 Business accelerators 1 Digital Business Space (a multifunctional digitalised innovative business centre for entrepreneurs) 15 Centres for business services 117 Co-working centres
Knowledge-application and exploitation subsystem	
7034 High-tech production enterprises	
14,914 High-tech IT firms	
277 Small innovative enterprises	

Source: Navigator of Information in the Capital

Through "Navigator of Information in the Capital", entrepreneurs can get up-to-date information not only about available resources but also about market opportunities, such as the demand for high-tech products and technologies among state-run organisations in

[46] https://imoscow.mos.ru/ru.

Moscow, and standards for the procurement of innovation. They can also apply for their offerings to be included in the Catalogue of Exported Goods and Services, which is the basic tool for promoting Moscow-based firms in foreign markets. They can also apply for subsidies (up to 100%) to participate in Russian and foreign exhibitions as part of a collective stand under the general brand "Made in Moscow". Notably, however, as this portal is informational in nature, it does not maintain communication among RIS actors.

In Moscow, such innovation-driven markets as Smart City, intelligent houses, communal-services management, unmanned vehicles, smart healthcare and proactive security are actively developing (Official Portal of the Mayor and the Government of Moscow).[47] According to the PWC's research on the readiness of cities to introduce the technologies of the future, Moscow ranks fifth after Singapore, London, Shanghai and Barcelona. At the same time, Moscow has taken leading positions in such indicators as virtual services for citizens (e.g., portals and mobile applications for solving city-related problems and crowdsourcing ideas); infrastructure readiness; open, adaptive education and the digital economy.

Therefore, as of 2017, Moscow had all of the elements of a regional innovation system (see Figure 1.16). Consequently, it is an excellent context for studying the behaviour of innovative firms in terms of networking with RIS participants for the purpose of doing business.

2.5. Conclusions

The ultimate goal of this chapter within the frame of the current study was to build an understanding of the development of the Russian NIS in its various phases in order to lay the foundations for relatively objective interpretations of entrepreneurs' decisions regarding the creation of their networks. In particular, the analysis in this chapter makes it possible to make assumptions about the perceived benefits, opportunities, costs and risks that firms in Russia face in building network relationships supportive of innovation.

This chapter has provided a detailed analysis of the trajectory of NIS development in Russia over the past 26 years. This path was littered with challenges, including the almost complete loss of scientific and engineering capacity at the very beginning of the journey, and the need to develop an innovative system that comprised all of the groups of actors and mechanisms necessary to promote innovation. An analysis of the formation of the Russian NIS with the help of the frameworks presented in Table 2.1 suggests that the NIS passed through several stages, from the creation of fundamental framework conditions to the emergence of a variety of innovative activities. The key findings of the analysis of each of

[47] https://www.mos.ru/news/item/32703073/.

the five identified phases of development presented in this chapter are summarised in Appendix 2.2, which is structured according to the main categories considered in the analytical models (see Table 2.1).

In many respects, the trajectory of the Russian NIS's development was determined by path dependence. The legacy of the Soviet Union, including the central role played by the state in managing and financing the scientific and technical spheres as well as industrial implementation, limited the range of possible steps in each subsequent phase and, ultimately, determined the current state of the system. The government is the central actor in the Russian innovation system, which remains hierarchical and reflects the principle of centralised, top-down leadership (Dezhina and Etzkowitz, 2016). The state remains the main source of financing for the development of the innovation system in terms of the funds allocated for the development of innovative companies and the innovation infrastructure (Andrushchak et al., 2018), and in terms of the financial support provided to the scientific and educational sphere, where 70% of funding is provided by the state. Market-based financing mechanisms are still in a semi-embryonic state. Moreover, the venture-capital landscape is still unstable and unable to develop independently because of systemic problems. The main challenges have been the lack of high-quality start-ups at the beginning of the venture cycle, their inability to develop business for internal and external reasons, and the lack of developed markets for innovative products that would allow venture capital to successfully exit investment deals.

Members of the Russian venture community indicate that the number of attractive investment projects has fallen in recent years: "All low-hanging 'fruits' are eaten, so it's time to move on to the systematic growing of start-ups" (Andrushchak et al., 2018, p. 46). This proposal implies a need for a top-down system of measures. Although the state is working to stimulate the appearance of start-ups at universities as well as spin-off companies resulting from intrapreneurial corporations' efforts, a steady stream of start-ups has not yet emerged. This implies that the infrastructure created for commercialisation, such as technoparks, may stay idle. Therefore, it seems important to evaluate the links emerging in the innovation system and how these features might affect networking behaviours that foster innovation in companies that have emerged on their own rather than owing to the initiative of the state. In other words, it is vital to assess the capabilities of the Russian NIS in terms of supporting the bottom-up approach. Thus, we can extend the table in Appendix 2.2 by looking at the peculiarities of the links in the system during each of the development periods. At the same time, we can theoretically examine the benefits, opportunities, costs and risks that might be considered by companies attempting to build networks in the context of the Russian NIS (see Table 2.23).

Table 2.23. Analysis of links and networking peculiarities in the Russian NIS

	Phase 1 (December 1991 – December 1999)	Phase 2 (2000 – 2005)	Phase 3 (2006 – 2008)	Phase 4 (2009 – 2013)	Phase 5 (2014 – 2018)
Links (flows of)					
• Knowledge	Broken ties between the scientific and technological communities.	Growing gaps in knowledge. The extinction of certain areas of development in connection with the destruction of the scientific and R&D systems, and the departure of scientists and engineers. Few links between universities and the industrial sector of the economy.	Consolidation of the scientific community, which is largely self-governed. Separate, non-systemic links between knowledge produced in higher-education and research institutions, and the knowledge that is in demand in the productive sector of the economy.	Universities forced to build ties with business and intensify technology transfers. Differences in perceptions of the goals, values and motives of scientific and engineering activities among scientists, inventors, investors, business and development institutions. Lack of demand for innovative scientific and technological developments among businesses.	An attempt to build knowledge-transfer mechanisms. No systematic approach or effective mechanisms. The activation of the demand for innovation from the business side is beginning. Establishment of some partnerships on the basis of institutional ties (corporation-university consortiums).
• Information	Lack of systemic mechanisms for collecting and transmitting relevant information. Distorted and unreliable information.	Introduction of some systemic mechanisms for collecting and transmitting relevant information. Shortage of information. Information is unreliable and insecure.	Perfection of information-collection and transmission systems. Broad development and implementation of the Internet. Lack of trust in Russian sources of information. Lack of a cognitive framework for information interpretation.	A significant amount of heterogeneous, unstructured, inconsistent information. Difficulties in obtaining reliable information. Lack of a cognitive framework for information interpretation.	The emergence of a more structured information space. The emergence of single-window systems that provide comprehensive information. Broad development of electronic public services. The continuing lack of trust in official information sources (the desire to verify information through trusted contacts). Various cognitive frameworks used by various NIS actors for interpretation.
• Capital	Lack of financial resources. The main source of funds is the	Lack of financial resources. The main source of funds is the	Lack of financial resources. The main source of funds is the state. The emergence	Lack of financial resources. The main source of funds is the state. Widespread granting	Lack of financial resources. The main source of funds is the state. Lack of growth in private-public

	state.	state. Financial aid in the form of foreign grants for R&D.	of examples of the public-private method of financing.	of grants and subsidies. Reductions in expenses due to system of tax privileges. The activation of private-public financing methods. The emergence of private investors. Expansion of forms of financing. Some examples of corporate financing.	and private financing. Weak growth in corporate financing. State resources are mainly provided on the principle of partial reimbursement of incurred costs.
• Resources	Practically absent. As a rule, access can only be obtained through reciprocal, mutually-binding *svyazi* or *blat*.	Lack of resources. Access can usually be obtained through connections in influential circles.	Lack of resources. Access can usually be obtained through connections in influential circles. Timely information begins to play an important role.	The emergence of opportunities to gain access to resources, subject to a high degree of activity and understanding of the rules for gaining access.	Active development of market mechanisms for competition for resources.
Networking					
• Principal networking mechanisms	Informal social networking and personal arrangements. Widespread use of *blat*-based relations and *svyazi*.	Informal social networking based on personal contacts and *svyazi*. Monetisation of *blat*-based relations.	The emergence of opportunities for the formalisation of certain relations. Social networking plays an essential role in gaining access to unbiased and undistorted information. Personalisation of bureaucracy.	Boom in opportunities for networking. Free communication to obtain information. Mechanisms of referrals and recommendations to obtain access and contacts with the right people in the private sector. Personalisation of state bureaucracy.	Reduced opportunities for networking in terms of professionalising relations and reducing the desire of NIS actors to make open contact. The mechanisms of networking in new circumstances need to be studied and understood.
• Benefits of networking – access to:	Material and financial resources, complementary skills, property rights.	Material and financial resources, complementary skills, sales channels, property rights.	Material and financial resources, external information, complementary skills, channels to introduce offerings to the market, property rights (including intellectual property).	Material and financial resources, external information and knowledge needed for commercialisation, complementary skills, channels for faster introduction of offerings to the market, property rights (intellectual property).	Material and financial resources, external information, knowledge and technologies needed for commercialisation, complementary skills, channels for faster introduction of offerings to the market, property rights (including intellectual property).
• Networking	Negotiate permission	Share risks; operate in	Access mechanisms to	Access insights, gain faster	Provide insights, gain faster

opportunities – ability to:	for entrepreneurial activity.	the chain of procurement and supply in existing clan systems and, thereby, guarantee market share.	support decision making, accelerate bureaucratic procedures, operate in the chain of procurement and supply in existing systems and structures.	access to capital, ensure legitimacy and credibility, improve competitiveness, receive moral support, accelerate bureaucratic procedures.	access to capital, ensure legitimacy and credibility, improve competitiveness, receive moral support, accelerate bureaucratic procedures, reduce risks by obtaining information on failed approaches.
• Costs of networking	Extremely high transaction costs. High coordination costs mitigated by personal agreements and mutual obligations.	High transaction costs. High coordination costs mitigated by personal agreements and mutual obligations.	High transaction costs. High coordination costs mitigated by personal agreements and mutual obligations.	High transaction and coordination costs owing to the high heterogeneity of knowledge and information among NIS participants, and the bureaucratisation of interactions with government bodies and investors.	Some reduction in transaction costs due to increased availability of information. Increased coordination costs due to the need to compete for the opportunity to gain access to resources, and high bureaucratisation of interactions with state bodies and investors. Additional costs associated with the need to obtain certain knowledge to sustain professional communication with NIS participants.
• Risks of networking	Relationship risks, socio-economic risks, criminogenic risks and risk of the inability to be protected against them.	Relationship risks, socio-economic risks, risks related to environmental uncertainties, network-structure-related risks.	Relationship risks, socio-economic risks, risks related to environmental and behavioural uncertainties, network-structure-related risks, human-related risks, instrumental risks.	Relationship risks, risks related to environmental and behavioural uncertainties, network-structure-related risks, human-related risks, instrumental risks, reputational risks, risks related to the draining of scarce resources due to requests from investors and development institutions.	Relationship risks, risks related to environmental and behavioural uncertainties, network-structure-related risks, human-related risks, instrumental risks, reputational risks, risks related to the draining of scarce resources due to requests from investors and development institutions, risks associated with a conflict of interests if an entrepreneur is a member of several networks.

The Russian NIS's development path was not completely evolutionary and consistent. The NIS's development depended on external factors related to changing economic and social conditions, and on internal political considerations that compelled the country's leadership to make certain decisions. The analysis of the implementation of long-term, strategic federal programmes adopted during various stages of NIS development shows that most of these programmes failed to achieve the set targets (see, for example, analysis of the Strategy for the Development of Science and Innovation for the period until 2015, Table 2.14). The long-term strategic-level programmes have continually been replaced with new programmes even before the stated deadlines for their fulfilment. This has been the case for objective reasons (e.g., a decline in their relevance due to changes in external conditions owing to economic crises) and as a result of internal political decisions related to a desire of using them as electoral platforms. For example, previous development paths were significantly changed in 2011-2012 and 2016-2017. Notably, such periods converged with presidential campaigns, during which the government needed to demonstrate extraordinary activity in this area, sometimes at the expense of consistency, in order to attract the attention of the electorate. From this point of view, instead of serving as effective management tools in the long run, these programmes often indicated the general direction of NIS development and helped to organise the process on a short-term scale only. In many instances, state funds allocated to programmes were spent even though true results were not forthcoming. This occurred, for example, with the construction of technoparks and the introduction of special economic zones. In a sense, the strategic landmark was again altered in July 2017 when the federal programme "Digital Economy of the Russian Federation" was introduced, in fact, shifting the focus of attention of general public from the National Technological Initiative. Moreover, it absorbed some of the NTI indicators that had not yet been achieved. Increasingly, the press carries expert reports that NTI initiatives actually "do not fire" in terms of rapid and tangible results (Sukhova, 2017).

In many ways, the Russian NIS was built in an experimental way. These experiments included attempts to apply the experiences of the highly developed market economies of the US and Israel, especially from 2009 to 2012. Attempts to copy best practices were visible in the mechanisms used for stimulating NIS development, in the general atmosphere of the innovation environment and in the topical issues discussed among NIS participants. This overall setting might have had an effect on networking decisions made by entrepreneurs. The changes in the external discourse and available mechanisms might also have affected attitudes towards networking in other periods. From this point of view, the results of the NIS development efforts in each stage (see Appendix 2.2) are as

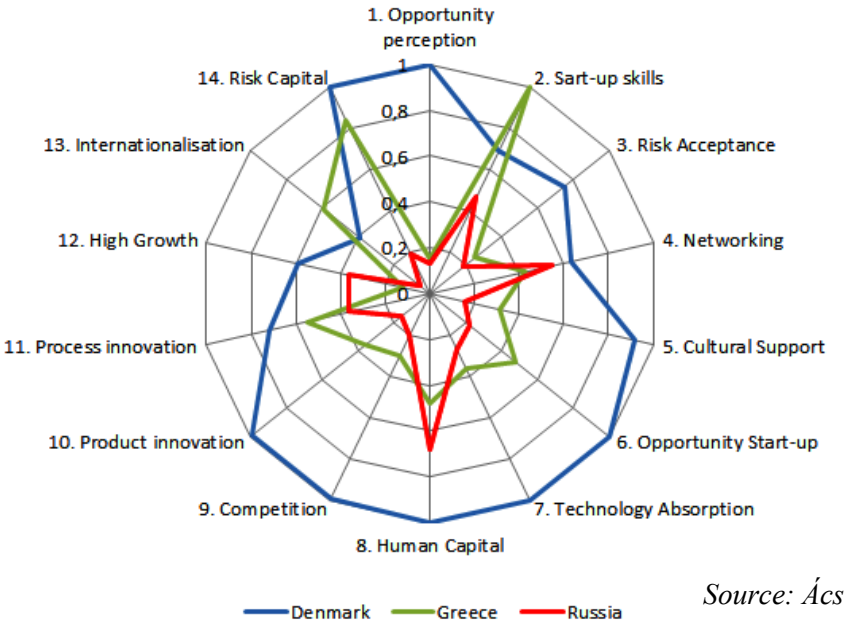
important as the deeper understanding of the features and key priorities of each phase. This is because people's perceptions of the extant situation influence their assessments of the significance of certain factors and, thereby, guide their decisions and actions.

A great deal of work at the last stage of NIS development has focused on improving its effectiveness. The results of extant national surveys[48] generally confirm the conclusions of international experts that the conditions for doing business in Russia as a whole have improved (see Doing Business indices, the World Bank Group, 2010-2018). According to the results of a survey of SME representatives conducted by NAFI in 2016, the following were the most acute problems hampering the activities of companies (in order of decreasing importance): falling demand, a lack of qualified personnel, rising prices and tariffs, corruption in government bodies, excessive control of business and supervisory pressure, excessively high taxes, difficulty in accessing sources of credit, unfair competition, high administrative barriers and the inefficient judicial system (Andreev, 2017). Notably, such problems as excessively high taxes and high administrative barriers were lower in the 2016 rating than in 2011, thereby allowing for the focus on external economic factors and the need for qualified personnel. In general, the results of the survey confirmed the positive effects of the state-financed support programmes implemented in recent years. The changes in the factors influencing entrepreneurial activity that occurred during the period of Russian NIS formation might have influenced entrepreneurs' perceptions of the necessity of forming networks.

Nevertheless, despite the significant amount of funds and effort invested in the creation of the Russian NIS, Russia's innovation activity still lags behind the level of innovative development evident in the leading countries. According to the assessment of international experts found in the Global Entrepreneurship Index 2018 (Ács et al., 2018), Russia underperforms when compared to strong entrepreneurial economies, such as Denmark (see Figure 2.47). Particularly significant in terms of the possibilities of creating an innovative economy are the gaps in indicators describing country's capabilities in term of product innovation, technology absorption, intrenationalisation, cultural support, risk capital availability and perceived opportunities to launch a successful start-up.

[48] In February 2016, NAFI conducted a representative all-Russian survey, which interviewed 500 senior employees of micro, small and medium-sized enterprises in 8 federal districts of Russia.

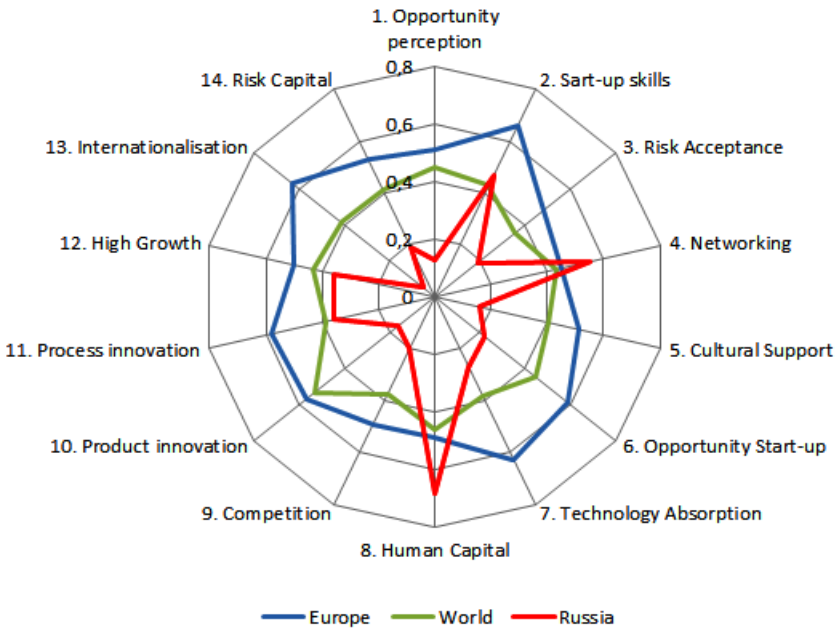
Figure 2.47. Global Entrepreneurship Index 2018, pillar-level comparison of Denmark, Greece and Russia



Source: Ács et al., 2018

Russia's main strength in this regard is the prevalence of high-quality human capital, which is vital for innovative start-ups that require an educated workforce. Another Russian strength is networking, where Russia even exceeds the corresponding European and world averages (see Figure 2.48). In the context of an ineffective NIS, personal ties can create the mechanisms necessary for innovative development and having a potential to compensate for institutional deficiencies in the innovation environment. Therefore, networking may become the driver of Russia's innovative development in the near future.

Figure 2.48. Global Entrepreneurship Index 2018, pillar-level comparison



Source: Ács et al., 2018

The Russian NIS is built within a top-down paradigm. Until bottom-up mechanisms based on networking are introduced, the system will be unstable. To help these mechanisms emerge, it is necessary to understand how business perceives the usefulness of the Russian innovation system for establishing links conducive for doing business and engaging in innovation. Thus, several key questions arise. How do entrepreneurs use Russia's innovative infrastructure? With which actors in the innovation system do entrepreneurs interact? How do SMEs make decisions about building relationships in order to develop their business? What affects entrepreneurs' decisions to establish relationships? The answers to these questions will help determine the measures that can help SMEs become more effective at using the opportunities provided by the Russian NIS. In order to answer these questions, it was necessary to conduct a primary study, the results of which are presented in Chapter 3.

Chapter 3. Study of Russian entrepreneurs' networking behaviour

The ultimate purpose of this chapter is to examine the role of networking in innovation by comparing the networking patterns of companies characterised by different degrees of innovativeness in order to provide qualitative empirical evidence of the interrelations between firms' innovativeness and their networking activities. The chapter considers the networking behaviour of firms acting in the context of the Moscow RIS and implementing concrete projects to bring their offerings to the market. The primary data used for the analysis in this chapter were gathered from interviews with Moscow-based entrepreneurs covering the specifics of their networking behaviours.

The first part of this chapter explains the research methodology chosen by the author to study the networking behaviours of firms. It begins by summarising the findings from the literature that helped in the identification of the main areas of primary research, then proceeds to the formulation of the key questions; a discussion of the epistemological, ontological and philosophical underpinnings of the study; and an explanation of the research design. The second part is devoted to presenting the results of the analysis of the qualitative data. It begins with an explanation of the grouping of the collected data based on the innovativeness of the entrepreneurial projects under consideration. Thereafter, the results of the analysis of the interviews are presented in order to derive answers to the key research questions. The results of the analysis and the implications for this study are summarised in this chapter's conclusions.

3.1. Research methodology

3.1.1. Aim and research questions

The broad aim of this study is to ***examine the role of networking in innovation among Russian entrepreneurs***. More specifically, the objective is to identify whether the nature of the business activity (conventional versus innovative) influences networking behaviour. To achieve this objective, the following key proposition was investigated: entrepreneurs in different innovativeness categories use different networking patterns to support their business activities, including innovation.

To formulate research questions, it is necessary to build on the relevant international literature, which was reviewed in Chapter 1. The network-interaction theory discussed in Chapter 1 suggests that networking is a tool that provides entrepreneurs with access to information, resources and scientific knowledge that can enable their organisations to cross

the "valley of death" and become profit-generating businesses (Hisrich, 1990). As the literature indicates, an entrepreneur's networking behaviour, especially in the context of transition economies, is insufficiently understood. This is particularly true in the context of Russia. Given the relatively recent emergence of entrepreneurship as a phenomenon in Russia, Russian entrepreneurs need more than advice, information and resources – they need moral encouragement, skills, knowledge and managerial experience, all of which are scarce. Innovative entrepreneurship is an even newer endeavour in Russia and one surrounded by more uncertainty owing to structural holes in the business models of innovative ventures and the lack of effective external support mechanisms. Therefore, innovative entrepreneurs are likely to be more active in their attempts to build a support network. That network, in turn, may possess certain characteristics in terms of density, diversity and structure that differ from those of networks of traditional entrepreneurs. In fact, innovative entrepreneurs may even implement a strategy for building network interactions that reflects the differences in the fundamental goals of traditional and innovative entrepreneurship (i.e., quality and efficient service of a well-known consumer segment, and the development of a new technology, new market and new demand, respectively). In addition, the analysis of the theoretical literature provided in Chapter 1 suggests that purposefully built links can be perceived as a type of resource (i.e., social capital), the value of which increases in line with the degree of innovation. However, at the same time, the construction and governance of relationships involves certain costs, which might deter entrepreneurs from using networking strategies.

The literature review (see Chapter 1) provides the conceptual context for the study and leads to the identification of key research areas as presented in the Table 3.1.

Table 3.1. Implications from the literature relevant for the current study

Key ideas found in the literature	Source	Identified area of research
▪ Relations serve as a medium through which entrepreneurs gain access to a variety of resources ▪ Contacts are viewed as a source of business information, advice, emotional support and problem solving ▪ Recommendations and referrals play an important role in establishing links ▪ A start-up becomes a focal actor in the network ▪ Entrepreneurs tend to establish person-to-person relations ▪ Informal interactions at the individual level are perceived as more manageable ▪ Different ties might be needed in the different stages of a company's development	Hoang and Antoncic, 2003; Borgatti and Foster 2003; Fagerberg et al., 2006; Markham et al., 2010 Jack et al., 2010; Slotte-Kock and Coviello, 2009; Turyakira and Mbidde 2015	Role of networking in the founding and development of businesses (RQ1)

▪ Networks develop over time ▪ Entrepreneur's relationships tend to start off as relatively formal and then evolve into friendlier versions ▪ Embedded ties can provide benefits but sometimes can harm the development of the business	Larson and Starr, 1993; Hite and Hesterley, 2001; Slotte-Kock and Coviello, 2009	Evolution of networks (RQ2)
▪ Interpersonal trust is an important mediating factor influencing the networking behaviour ▪ Trust between business participants change over time ▪ Trust increases from the positive outcome of repeated interactions	Newell and Swan, 2000; Hoang and Antoncic, 2003; Smith and Lohrke, 2008; Turyakira and Mbidde, 2015	Role of trust in building a business relationship (RQ3)
▪ Previous entrepreneurial experience and education influences the process of acquiring resources through networking ▪ Novices and experienced entrepreneurs behave differently in relation to networking strategies and tactics	Schoen et al., 2005; Aarstad et al., 2015	Role of experience in networking behaviour (RQ4)

Source: Developed by the author

In summary, it seems appropriate to focus on the following series of research questions, the answers to which will lead to the achievement of the research aim. Each question builds upon the previous question, which allows for a continually deeper examination of the essence of the focal phenomenon. As the proposed study is qualitative, the questions are open-ended.

RQ1: What role does networking (external relationships) play in the founding and development of businesses in the Russian context in relation to their degree of innovativeness?

- ***How do Russian entrepreneurs network?***
- ***What contact sources are used and why?***
- ***What aims do Russian entrepreneurs have when they engage in external relationships?***
- ***How do Russian entrepreneurs govern their network of business contacts?***

When answering these questions, the following proposition will be investigated: the greater the start-up's innovativeness, the more actively entrepreneurs are engaged in networking and the wider their network of contacts. In addition, the aims and tactics of networking can change depending on the company's degree of innovativeness.

RQ2: In terms of an entrepreneurial venture's development, how does the network of relationships evolve over time?

- ***How do relationships with partners and customers change over time?***
- ***How do the relations between people evolve over the course of business development?***

When answering these questions, two propositions will be investigated. The first is that the evolution of relationships with partners is driven by the tasks that the company must solve in certain stages of its development, while the evolution of relationships with clients is largely determined by market characteristics. The second is that entrepreneurs' ties with network participants always evolve into friendlier relations.

RQ3: What role does trust play in building a business relationship?

- ***What role does trust play in building a business relationship?***
- ***How does trust between business participants change over time?***

When answering these questions, the following proposition will be investigated: entrepreneurs in different innovativeness categories have different perceptions of the role and mechanisms of trust.

RQ4: Does networking behaviour evolve as entrepreneurial experience increases?

When answering this question, the following proposition will be investigated: novice and experienced entrepreneurs engage in and build their networks in different ways.

Given the relatively recent emergence of entrepreneurship as a phenomenon in Russia, it is important to note that Russia has no yet established, recognised or proven approaches to either running one's own business, or to building relationships and networks supportive of the effectiveness and efficiency of such a business. The overwhelming majority of entrepreneurs are first-generation. In other words, they are people who had to find the best way to start and build a business on their own, often through trial and error.

Innovative entrepreneurship in Russia primarily takes the form of technological entrepreneurship because of the Russian understanding of the essence of innovation and approaches to its development (see Chapter 2). Technological entrepreneurship is an insignificant part of what is already a relatively small entrepreneurial sector. As shown in Chapter 2, Russia has historically had a gap between scientific education, the main purpose of which was the generation of scientific results, and commercialisation. Russian scientists and engineers have never been trained in the art of entrepreneurship and their attention has never been focused on the possibility of commercialising inventions. Therefore, Russia finds itself in a situation in which entrepreneurial, managerial and technological competencies are not embedded in the same people, which implies that commercialisation cannot effectively occur. Thus entrepreneurs may need external help to travel the path from

the scientific idea to laboratory confirmation to the emergence of an experimental model and, thereafter, an industrial model and successful launch of the product in the market.

As discussed in Chapter 2, in the late 1990s, Russia adopted a trial-and-error approach to developing a national innovation system (NIS) designed to promote the growth of innovative entrepreneurship. The Russian NIS, which has basically been built from scratch in less than 20 years, has certain shortcomings, which make innovative entrepreneurship more difficult and riskier than traditional entrepreneurship. The discussion presented in Chapter 2 suggests that the distinct phases of the Russian NIS's development might have affected entrepreneurs' networking decisions. In order to derive a meaningful interpretation, it makes sense to consider the creation of networks by entrepreneurs in the context of the fourth and fifth phases of the NIS's development (i.e., starting from 2009). By that time, key groups of actors, subsystems, structures and development institutions of the Russian NIS had already appeared. This approach will allow for conclusions to be drawn about how and for what purposes entrepreneurs interact with NIS actors.

As discussed in Chapter 2, the Russians' attitudes towards entrepreneurship were also affected by a lack of confidence in their own qualifications due to the fact that managerial and entrepreneurial education programmes were not available in the Soviet era. Managerial education only appeared in Russia around the year 2000, prior to that point it had been considered to be a subdivision of economic education that included very limited spectrum of disciplines. Moreover, higher-education institutions did not begin to specifically consider issues and develop disciplines related to entrepreneurial activity for another five years. At the same time, technical education had a long tradition in Russia. It helped to form structured thinking capabilities, the ability to understand cause-and-effect relationships, and the ability to plan and mathematically assess the consequences of certain actions. Thus, it can be assumed that current Russian innovative entrepreneurs are more likely to have completed a technical education than a programme focused on management. As such, absence of background managerial and entrepreneurial education might also affect the networking behaviour of Russian entrepreneurs.

At the same time, Russia exceeds the European and world averages in indices covering possibilities for and the ability of networking (see Figure 2.48). From this perspective, it seems advisable to study how Russian entrepreneurs build their external relations to foster innovative development and how they compensate for institutional deficiencies in the innovation environment. In that regard, the results of this study might be of interest to a wide range of Russian entrepreneurs and to higher-education institutions in relation to the

formation of networking skills in young entrepreneurs, which are necessary to drive Russia's innovative development in the near future.

3.1.2. Epistemological, ontological and philosophical underpinnings

Ontological and epistemological assumptions reflect the researcher's fundamental views on what exists and how human beings, as thinking agents who perceive existence, can learn about what exists (Morgan and Smircich, 1980; Barnes, 1996; Gruber, 1995). In the current study, which aims to develop an understanding of the deep nature of entrepreneurial networking, existence is viewed as a projection of individual consciousness (Morgan and Smircich, 1980). The author adopts the assumption that the entrepreneurs being interviewed believe what they see (Audi, 2011, p. 24), and that they are able to reflect on their own experience, understand reality, describe reality and effectively convey those views (a property of being meaningful; Garrick, 1999, p. 147). Furthermore, the author can reconstruct existence by interpreting the opinions that the people being interviewed express in words. As such, the current study can be characterised as *interpretive* (Myers, 2009), as it focuses on meaning in context. In the interpretive philosophical paradigm, "causes and effects are mutually interdependent, inquiry is always value-laden, and context influences the framing and conduct of research" (Garrick and Rhodes, 2000, p. 206). Therefore, it can be said that an entrepreneur's understanding of the role of networking in business-project development depends on the entrepreneur's background and related entrepreneurial experience (path dependence; Mahoney, 2000), the entrepreneur's social and cultural identification (Coleman, 1988), and the entrepreneur's level of competence and analytical capacity (bounded rationality; Simon, 1991).

In the current study, it is assumed that participating entrepreneurs were able to act choosing the best possible option in light of all available evidence and that they put maximum effort into achieving their goals. It is also assumed that, in these efforts, the entrepreneurs could evaluate the success of their entrepreneurial projects by considering the conformity of the plans with the results in the context of the restrictions and risks that they could mitigate accordingly.

Each entrepreneur taking part in this study can only express his or her point of view. That point of view reflects that individual's own experience, which could be of a very situational nature, including an element of luck or failure due to factors unrelated to networking. Therefore, respondent opinions are likely to be characterised by a high degree of diversity, which will most likely reflect respondents' personal situations and

perceptions. As such, these respondent opinions do not necessarily testify to the existence of objective trends, as such trends simply did not have time to develop in Russia. Consequently, in the Russian economy's current context, the relevance of quantitative statistical analysis for obtaining meaningful answers to this study's central questions is, in principle, questionable. On the other hand, in-depth interviews should reveal the grounds on which entrepreneurs make certain decisions regarding the construction of their networks.

Given these epistemological and ontological assumptions, the interviews within the current study cover not only factual aspects but also respondents' understanding of developments. It is assumed that respondents' interpretations can be viewed as relatively accurate reflections of what was really happening. Examples of the factual and interpretative questions are presented in Table 3.2.

Table 3.2. Examples of interview questions

Factual questions	Interpretative questions
▪ What is the name of your company? ▪ Is this your first entrepreneurial experience? ▪ How many people were founders of this business? ▪ How many people are currently employed by your company? ▪ Does your company have registered patents?	▪ Is your company a technological start-up? ▪ What is the degree of novelty in the business venture? ▪ In your opinion, to what extent did your product or service create value for customers and match their expectations at the time of its market launch?

Source: Developed by the author

3.1.3. Research design

3.1.3.1. Summary of research design

The research questions and fundamental research assumptions described in the previous sections determined the research design used for this study. The research design is described in Table 3.3 (based on the "research onion" concept; Saunders et al., 2016, p. 151).

Table 3.3. Summary of research design

Philosophy	Interpretivism
Research paradigm	Induction
Methodological choice	Mixed method (mainly qualitative with quantitative analysis of sample characteristics)
Strategy	Grounded theory, ideal-type analysis
Research scope	Entrepreneurial projects that resulted in the launch of concrete offerings in the market by Moscow-based SMEs
Time horizon	March-September 2017
Techniques and procedures	Data-collection instrument: interview Data-analysis method: grounded theory approach
Sampling approach	Research objects: traditional and innovative SMEs (target: at

	least 10 in each innovativeness category; no less than 50 in total) Respondents: owners or mentors of SMEs Location: SMEs registered in Moscow or the Moscow region Selection criteria: reached at least the prototype stage of business-project development

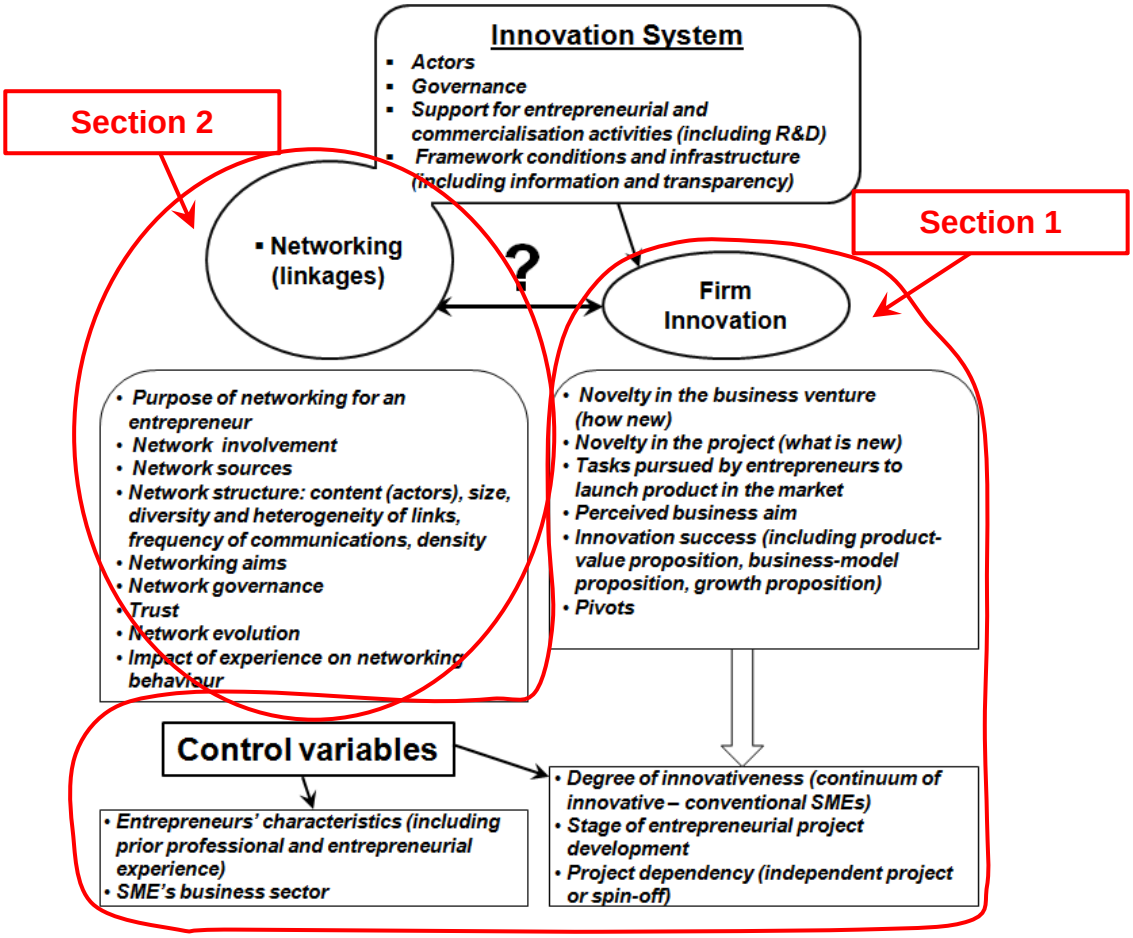
Source: Developed by the author

3.1.3.2. Data-collection instrument

As this study is located in the interpretative paradigm, the author was interested in developing detailed, in-depth answers to the research questions. Therefore, the exclusive use of a questionnaire with closed questions as a data-collection tool was not considered. However, as the approach of this study required interviews of a large number of entrepreneurs, it was necessary to formulate a strategy that would reduce the potential for error due to variability in the words used by interviewees to express their opinions.

This study's conceptual framework, which was developed as a result of the literature analysis, determined the design of the data-collection instrument: an interview guide consisting of two parts, as presented in Figure 3.1 and Table 3.4.

Figure 3.1. The relationship between the study's conceptual framework and the data-collection instrument



Source: Developed by the author

The interview guide was developed as presented in Table 3.4 (see Appendix 3.1.).

Table 3.4. Interview guide structure

	Section 1	Section 2
Aim	Collect data related to control variables to be used for further grouping of SMEs in the qualitative analysis.	Collect qualitative information related to research questions.
Question type	Semi-structured.	Open-ended.
Content	Factual information about the SME, its product/service, market, competitive context, development stage, trajectory, perceived innovativeness, success achieved by the interview date.	Qualitative information about the SME's networking behaviour and its implications for business-project development.

Source: Developed by the author

The first section of the interview guide was more structured with intent to collect information about SMEs' characteristics. It was needed for SMEs' further grouping and understanding the common features of the companies making up these groups. The dimensions to evaluate SME's innovativeness were identified in the key literature on innovation (Henderson and Clark, 1990; Johannessen et al., 2001; Ries, 2011; Aulet, 2013; Keeley et al., 2013; Starbuck, 2014).

The second section contained open-ended questions to collect in-depth information needed to answer the research questions as presented in Table 3.5. The dimensions to understand networking behaviour were indentified in the key literature on networking (Hoang and Antoncic, 2003; Borgatti and Foster 2003; Slotte-Kock and Coviello, 2009).

Table 3.5. Mapping of research questions into interview guide questions

Research question	Dimension	Interview guide question
RQ1: Networking purpose, sources, aims, governance approaches	Network purpose	Question 31
	Network involvement	Question 32
	Network sources	Question 33
	Relationship between networking and outcomes	Question 34
	Network structure: size, diversity and heterogeneity of links; frequency of communication; network density	Questions 35 and 36
	Network aims	Question 37
	Network governance	Question 39
	Impact of embeddedness	Question 41
RQ2: Evolution of networks	Network evolution	Question 40
RQ3: Role of trust	Role and evolution of trust	Question 38
RQ4: Impact of experience on networking behaviour	Impact of experience on networking behaviour	Question 42 and all the previous questions to compare answers of novice and experienced entrepreneurs

Source: Developed by the author

Despite the fact that the first section was more structured, both sections served as a guide for the interviewer. It was assumed that the respondent would not simply choose one of the possible alternative answers but talk about the business project, highlighting what he or she viewed as the most important aspects.

3.1.3.3. Data collection strategy

The interview guide was initially developed in early March 2017. It was iteratively pilot tested in five interviews over the course of one month. After each iteration the guide was improved, mainly by simplifying the wording and by adding new alternative answers in order to make the guide more universal and suitable for both traditional and innovative SMEs.

Interviews took place from April to September 2017. The interviews were conducted in Russian. All interviews were recorded, after which the recordings were transcribed and analysed. During each interview, the interviewer took notes on the respondent's answers to key questions. The last three questions in the guide covered contact details to be used for follow-up purposes, the date of the interview and a request for the respondent's signature.

In April 2017, companies that were involved in arm's-length relations with Lomonosov Moscow State University Business School (MSU BS)[49] were invited to take part in the study. Some of these companies were projects run by graduates of MSU BS (limit set at a maximum of 10% of participating in the study SMEs). Moreover, many of the participating companies were owned by relatives or friends of current MSU BS students.

As the main objective of this study is to examine SMEs' networking behaviour, the non-probability convenience sampling technique (Sanders et al., 2007, p. 234; Bryman and Bell, 2007, p. 182) is appropriate. Although the convenience sampling technique is prone to bias and is beyond the control of the researcher (Sanders et al., 2007; Bryman and Bell, 2007), it is still suitable for addressing the aim in exploratory study and answering the research questions.

The objective of the study is to identify whether the nature of business activity (conventional versus innovative) influences networking behaviour. Therefore, in the first stage of data analysis, it was necessary to group the data based on such criteria as basis of business model, market features, and the scope and characteristics of operating activities. These criteria were adapted from Aulet and Murray (2013), who propose a set of characteristics that differentiate between innovation-driven enterprises and traditional

[49] The author of the thesis is an associate professor at MSU BS.

small businesses. Patterns were revealed by comparing the respondents' answers and assigning their firms to the appropriate groups. The analysis of the qualitative data gathered from about 30 initial interviews showed that the companies in the sample varied, primarily in terms of characteristics related to the operating activities. The division of the sample into only two groups (conventional versus innovative) would be misleading, as even the technology companies could be divided into two groups on the basis of the different logics behind their business models. Four groups were formed by adding several other differentiating parameters to the criteria suggested by Aulet and Murray (2013), such as the firm's role in the value chain for the consumer and others. These differentiating parameters were identified as result of a detailed analysis of patterns observed in respondents' answers undertaken in order to segment the data. Thus, the chosen approach allowed for identification of four different groups characterised by various patterns of entrepreneurial behaviour based on Aulet and Murray's (2013) criteria and other factors (see Section 3.2.1).

The patterns were interpreted from the point of view of firms' innovativeness using respondents' answers to questions about the aim of the business (question 10), the type of innovation (question 23), the novelty of the project (question 24) and the presence of registered patents (question 25). The similarities of respondents' answers regarding their firms' innovativeness were found and summarised for each group, as shown in Table 3.6. The innovative approaches adopted by companies belonging to different groups could be clearly distinguished, which solved the task of dividing the sample into groups based on their degree of innovativeness.

Table 3.6. SME innovativeness categories

Revealed patterns	Innovativeness category (IC)	Definitions
Pattern 1	**Very low (IC-very low)**	A company that uses an existing business model or its minor adaptation to satisfy the needs of a particular client segment; does not have patents
Pattern 2	**Low (IC-low)**	A company that is implementing incremental innovations
Pattern 3	**Medium (IC-medium)**	A company that is implementing an adaptation of an existing technology, or an architectural or modular innovation
Pattern 4	**High (IC-high)**	A technological company that is implementing a radical innovation or a combination of more than two types of innovations; has patents

Source: Developed by the author

After grouping the initial data, it became clear that the convenience-sampling strategy produced a biased sample that lacked innovative companies. Consequently, most of medium and highly innovative companies were accessed through referrals from NIS development institutions, such as RVC, Skolkovo and IIDF, and through the author's contacts at Technopark Strogino. In the course of additional data collection, which was performed from May to September 2017, interviews were conducted to ensure that at least 10 entrepreneurs had been interviewed in each group. As a result, data collection covered a total of 66 SMEs. On average, the interviews lasted about one hour, with discussion times varying from 45 minutes to 1 hour 50 minutes for innovative start-ups and from 30 to 60 minutes for traditional companies.

3.1.3.4. Method of analysis

The main data-analysis method used in this study was the grounded theory approach, as defined by Corbin and Strauss (1998). This approach offers the best fit for this study for several reasons. First, according to Corbin and Strauss (1998), grounded theory allows a researcher to derive conceptualisations from data without those conceptualisations being shaped by existing knowledge and understanding. In this case, the extant knowledge on and understanding of the role of networking in business development is mainly found in literature focused on Europe and the US. As such, it may be irrelevant in the Russian context. The use of a grounded theory approach allows insights to be drawn from the data to build an understanding, which then serves as a meaningful guide for additional research-related actions (Corbin and Strauss, 1998). Blaikie (2008) states that the grounded theory approach is about the logic of enquiry, and there is a clear inductive logic behind this methodology (Martin and Turner, 1986). A grounded theory is an example of an interpretive methodology (Corbin and Strauss, 1998), as a researcher derives meaning from texts that were collected by means of interviews. According to Myers (2009), the grounded theory approach differs from the other qualitative methods in that the creation of theory emerges from the "continuous interplay between data collection and analysis". In other words, primary data collection and analysis move in parallel. As soon as patterns and relationships are detected in the data, they are tested in the next data-collection round. In general, this study started without a clear picture of the networking behaviour of Russian entrepreneurs and was based on a desire to test certain propositions. Therefore, given this study's interpretive nature, the grounded theory method is highly relevant.

The grounded theory approach underlies the procedure for data processing used in this study and provides a mechanism for eliciting meaning from the data. Ideal-type analysis

(Weber, 1949; Swedberg, 2018) is used to compare the meanings obtained with regards to different categories (e.g., to compare the networking behaviours of traditional and innovative SMEs). This provides a perspective for qualitative data interpretation (Gerhardt, 1994). Ideal types are models or mental abstractions derived on the basis of generalisations of empirical data, which reflect certain essential characteristics of the focal phenomenon (Newman, 1998). The researcher can construct an ideal type of a process or social relation, and then compare it with another ideal type of similar relations that arise, for example, in different contexts or different groups of actors (Newman, 1998). As such, ideal types are analytical constructs that can be used as yardsticks to measure similarities and differences between specific phenomena or their manifestations in different contexts (Kvist, 2007), thereby allowing for differentiation. The construction of ideal types is useful, as it reduces the time needed to make decisions in situations that fall within the corresponding ideal type (Newman, 1998). However, this approach should be used with caution, as it is impossible to develop a perfect concept that fully captures the essence of empirical reality (Swedberg, 2018).

3.1.3.5. Risks and limitations in data collection and analysis

This section presents a discussion of the risks associated with data collection and analysis in this study, as well as the measures taken to mitigate those risks. The main risk in the proposed study related to the possibility that informants might not have been willing to share information. Another danger was that interviewees could provide false information or offer a vision of how the situation should be rather than describing how they actually built their networks to support business development. Both of these aspects were perceived as limitations of the chosen research method.

In terms of the first risk, a significant amount of work focused on ensuring that all respondents agreed to participate in the study as result of someone's referral, which in itself was an example of networking. More than 20 people refused to take part in the study either explicitly or implicitly by permanently postponing the interview. These refusals were perceived as relevant for the study. As these potential interviewees did not see value in this type of communication, despite the researcher's explanation of the study purposes, an assumption can be made that they were not good examples of networkers in terms of using networking as an instrument for development.

One way of managing the second risk was to exclude interviews in which falsifying behaviour was apparent. At this point, it should be noted that all respondents who agreed to an interview appeared to be very open, expressed a high degree of interest in the research

topic and said they had never thought about this topic before in detail. Many respondents even thanked the interviewer for allowing them to understand the importance of networking. Others noted during the interview that they could see ways of improving their networking effectiveness. Therefore, no interview records were discarded based on suspicions that data were being intentionally distorted.

Another risk was related to the research instrument and its wording. The interviews were to be conducted in Russian. Therefore, the interview guide was first developed in Russian, then translated into English and translated back into Russian to ensure that the English and Russian versions of the research instrument were identical. The interview guide was amended several times as result of pilot testing. Each time, the necessary corrections were made to the English version.

To ensure consistency, several procedures for collecting and analysing data were adopted. Each interview was audio recorded. Moreover, during the interview, the researcher took notes on answers given in Section 1. Some notes were also taken about interview-specific features that were relevant for interpreting the data (e.g., interview setting, unusual occurrences during the interview, emotional reactions of the interviewee, body language). Immediately after each interview, the researcher wrote short comments that described the initial impression from the interview. The purpose of this note taking was to record those aspects that would not be reflected in audio records.

The audio recordings were transcribed and their accuracy was verified by comparing the text with the actual recordings. The interview text was then coded (open coding). Coding is an analytical process through which "concepts and their properties are identified and dimensions are discovered" (Corbin and Strauss, 1998, p. 101). Flick (2009) adds that categories (concepts and dimensions) and the relations among them are important. Therefore, memos and analytical tables were constructed to increase the depth and quality of the analysis (Corbin and Strauss, 1998, p. 218). With each new interview, these memos and analytical tables evolved. New codes were added to the coding system when a new concept emerged in an interview. From a procedural point of view, some propositions were developed after each interview for testing in the course of the next interview.

This approach made it possible to understand the specificities of networking in the context of Russia's entrepreneurial and innovation environment. In particular, it led to the refinement of research questions. As a result, the search for answers to the research questions was conducted through a systematic analysis of the texts of transcribed

interviews, which were grouped as it was explained in the Section 3.1.3.3. Those texts were analysed using more structured coding methods, such as axial coding (Strauss and Corbin, 1998, p. 124) and focused coding (Charmaz, 2006, p. 57). This process allowed for data reassembling in order to obtain evidence relevant for the research questions and derive a theoretical conceptualisation.

The greatest limitation of this study is some voluntarism in the author's actions of attaching firms to one or another innovativeness category for subsequent analysis. The inaccurate breakdown of the sample into groups could lead to incorrect analyses, and affect the quality of the results and conclusions. In the analysis, some variability was found in the responses of respondents belonging to the same group to certain questions. However, for the aggregate of responses to the entire complex of questions, the within-group variation was lower than the variation between groups. Prior to beginning the analysis, several tests were undertaken to determine whether it would be appropriate to assign a firm to a certain group. In about ten cases, when the information necessary to make this decision was not available in an interview transcript, the author contacted the respondents again to ask questions that would make it possible to relate the firm to a certain group with greater certainty. Given the limitations of this study related to grouping, the data have been interpreted with extreme caution and in a way that emphasises the areas of maximum similarity of respondents' answers within the same group and the apparent differences in these responses from the answers of respondents from other groups.

3.2. Data analysis

3.2.1. Grouping of the companies included in the sample

To build an understanding of the distinctive features of the networking behaviour of entrepreneurs belonging to different innovativeness categories, the common features of the companies making up these groups were first identified. The companies were assigned to certain groups based on respondents' answers to interview questions about the scope and characteristics of operating activities, motives for founding the company, market features and customers (questions 4-9 in the Interview Guide; based on Aulet and Murray, 2013), as well as their responses regarding the location of the head office, the main focus of investments during the initial development stages, sources of financing, the geographical range of the company's sales, and the longevity of the product or service on the market (questions 18-22 in the Interview Guide). The analysis of similarities in respondents'

answers allowed for the identification of patterns and the formation of groups based on common characteristics of firms, as shown in Table 3.7.

Table 3.7. General characteristics of business enterprises

Parameter	Pattern 1	Pattern 2	Pattern 3	Pattern 4
Market	Traditional, stable market; goods or services for mass consumption, or a niche market requiring a high degree of customisation	Traditional, stable or weakly growing market; standardised product or service with slightly improved characteristics or more convenient mode of consumption	Niche market, developing due to technological solutions; in current economic crisis, demand is almost equal to supply	Market for a new or highly modified product or service, often accompanied by a new consumption model
Geographical range of the market	Local	Regional	Regional and global	Global
Stage of customer base evolution	Majority	Majority	Early adopters and early majority	No customers (customer discovery)
Understanding of customers' needs	High	High	Medium	Low
Presence of competitors	Many	Many	Some	Few
Competitive advantage	Customer loyalty, convenience, quality, individual approach	High quality of services, competitive price, more convenient consumption model	Heavily modified, more efficient technology to solve customers' problems	New or radically improved technology
Basis of business model	Customer loyalty	Strength of relations with partners	Progressive technology	Innovation
Firm's role in the value chain for the consumer	Serves the needs of customers	Links producers of goods/services to clients	Integrates the efforts of a modest number of participants to bring adapted or improved technologies to the existing market	Integrates the efforts of a large number of participants to bring radically improved or new technologies to the new market
Attitude toward strategic partner/parent company	Independent company; strategic partner either does not exist, or is a key supplier or a key customer	Independent company that distributes or assembles components provided by strategic partners; sometimes emerges as a result of parent-company diversification (horizontal or vertical)	Independent company; relations arise with strategic partners regarding the improvement of technology and the construction of the company's own production system	Independent company; in the absence of a strategic partner capable of assisting in commercialisation, a manufacturing company actively seeks to organise pilot and industrial production; rarely a spin-off company
Office location	Office and retail space rented closer to the client; very rarely located in co-working environment (usually for Internet shops)	Office and retail space rented closer to the client or closer to strategic partner; very rarely located in co-working environment (usually for IT companies)	Own production capacity; in the absence of own sales or sales through the Internet, office can be rented or placed in co-working environment; usually not allowed to become residents of technoparks due to lack of innovation	At the earliest stage, work from home or co-working environment; then become technopark residents

Source: Developed by the author

Furthermore, within the groups, respondents' answers to the questions 10, 23, 24 and 25 were analysed in order to identify similarities in approaches to innovation. In this analysis, an attempt was made to interpret the grouping of firms not on the basis of respondents' answers to a single question related to innovativeness, but based on an examination of respondents' discourse about their firms' innovativeness in which they described a complex of issues reflecting the multifaceted aspect of business and, more specifically, of innovation. The difficulty in confirming the validity of grouping arose from the fact that responses from some firms in one category to, for example, the question "What is new in the project?" (question 24) could seem somewhat similar to those of respondents from companies other categories, even if the respondents revealed differences in answers to other questions. An analysis of the answers to questions 10, 23, 24 and 25 in the aggregate suggests that companies in different categories still demonstrate different innovative patterns, as shown in Table 3.8.

Table 3.8. Characteristics of companies in relation to innovation

Parameter	Pattern 1	Pattern 2	Pattern 3	Pattern 4
Logic behind the business model	Comes from clients' needs related to the traditional product/service; suppliers or partners selected to ensure clients' needs are met	Comes from an existing product, and existing relationships with suppliers and partners; value is added to augment the quality of the product/service; segment of interested customers is then identified and relevant communication channels are built	Comes from company's technological ability to significantly improve the product/service; the segment of interested customers is then identified and relevant communication channels are built	Comes from a new idea about satisfying the client's (unconscious) needs; leads to the creation of a new product/service; discovery, development and education of the market
Attitude toward technology	Present due to the supplier	Present due to the supplier and partner; company mostly carries out refinement by improving the convenience of consumption	Company carries out independent improvements/adaptations of the technology and creates the product/service	Company independently develops the technology and creates the product/service
Presence of patents	Do not have patents	Do not have patents	Some companies have patents, the presence of which is perceived as useful for doing business	Have patents or are in the process of their registration, and their presence is perceived as a prerequisite for doing business
Degree of novelty	Existing business model (perhaps with a minor adaptation) to satisfy the needs of a particular client segment	Incremental innovations	Adaptation of an existing technology, or an architectural or modular innovation	Radical innovation or combination of more than two types of innovations

Source: Developed by the author

An analysis of Table 3.8 shows that different groups are characterised by varying degrees of innovativeness. At the same time, innovation plays different roles in the business models adopted by firms in each group, and the significance of innovation varies from group to group. For example, for firms belonging to Pattern 1, innovation is not the focus of attention – firms in this group do not produce innovations, although they may use innovative products. For companies grouped under Pattern 4, innovation is the basis for doing business and business begins with a new idea that offers the potential for commercialisation. Thus, the grouping of firms reflects differences in the level of innovativeness. For the convenience of interpretation, the patterns have been named according to the level of innovativeness exhibited by the firms in the group, as shown in Table 3.9.

Table 3.9. SME innovativeness categories

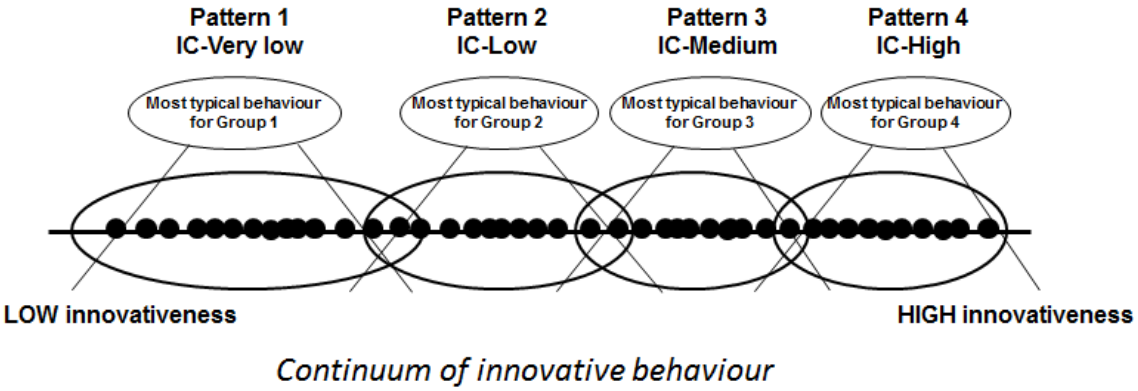
Revealed patterns	Innovativeness category (IC)	Definitions
Pattern 1	**Very low (IC-very low)**	A company that uses an existing business model or its minor adaptation to satisfy the needs of a particular client segment; does not have patents
Pattern 2	**Low (IC-low)**	A company that is implementing incremental innovations
Pattern 3	**Medium (IC-medium)**	A company that is implementing an adaptation of an existing technology, or an architectural or modular innovation
Pattern 4	**High (IC-high)**	A technological company that is implementing a radical innovation or a combination of more than two types of innovations; has patents

Source: Developed by the author

Given that respondents could not objectively evaluate the innovativeness of their firm, they gave relative assessments in which they compared their activities with those of other firms known to them. Therefore, the grouping helps determine the ordinal location of each firm on the continuum from a low-innovative (conventional) to a highly-innovative business. However, the grouping does not indicate the absolute value of the firm's innovativeness or assist in assessing the exact degree of difference in innovation between groups. The value of the grouping developed in this study is that it allows for traditional business indicators (e.g., market, competitiveness, firm's role in the value chain for the consumer and others) to be connected with the level of innovativeness. An understanding of the characteristics of the businesses considered within the innovativeness categories identified in this study is important, as it establishes the context for further interpretations of respondents' answers regarding their networking behaviours.

The fact that, at times, the answers of some respondents belonging to one group resembled those of respondents in other groups suggests that the resulting groups are not mutually exclusive, as visually represented in Figure 3.2.

Figure 3.2. This study's approach to the construction of groups



Source: Developed by the author

Moreover, this study takes many parameters into account. Therefore, the picture is even more complicated, as the research is conducted in a multidimensional space. The common behaviours of firms in one group (pattern X) are defined and compared with the common behaviours of firms in another group (pattern Y) in order to uncover and interpret the differences. This approach helps to determine ideal types of behaviours in various groups (Weber, 1949; Newman, 1998) based on the comparison of collected empirical data. In this study, the emphasis is on differences based on the argument that diversity increases transaction and coordination costs and determines variations in strategies for interaction with various groups. The presence of intersections among the groups in the form of similar responses is not a methodological problem, as homogeneity is the desired effect and will be revealed in any case. As such, the proposed grouping is justified even though the categories are not mutually exclusive. As the research is exploratory in nature, its main purpose is to formulate hypotheses, which can be done using the proposed approach to grouping.

3.2.2. Description of data

On the basis of the data-collection strategy described in Section 3.1.3.3 above, 66 interviews were undertaken with representatives of different SMEs. The analysis of the data (see Table 3.10) shows that innovative companies emerged in the last two phases of NIS development. This relates to the data-collection strategy, as access to those SMEs was

obtained through development institutions and technoparks, which did not emerge until Phase 4 of NIS development.

Table 3.10. Structure of data collected

Degree of novelty	Total	Phase 1 (1991-1999)	Phase 2 (2000-2005)	Phase 3 (2006-2008)	Phase 4 (2009-2013)	Phase 5 (2014-2017)
Very low	25	2	2	0	12	9
Low	19	1	1	1	7	9
Medium	12	0	0	0	7	5
High	10	0	0	0	3	7
	66	**3**	**3**	**1**	**29**	**30**

Source: Developed by the author

As the purpose of this study is to compare the networking behaviour of innovative and conventional SMEs that launched activities in Phases 4 and 5, a sample of 59 companies (out of 66) were left for further research. To understand the structure of the data, a coding system was developed (see Appendix 3.2). The answers to the Section 1 questions (see Appendix 3.1) registered by the interviewer during the interview were compared to data from the transcribed recordings, and then coded in accordance with the coding system as presented in Appendix 3.3. The characteristics of the obtained data are described in Table 3.11.

Table 3.11. Data characteristics

Degree of novelty	Total	Interviewee		SME business sector				
		Male	Female	Production	B2C services*	IT sector	B2B/B2G services**	Wholesale and retail trade
Very low	**20**	9	11	4	8	0	3	5
Low	**17**	13	4	6	5	3	2	1
Medium	**12**	12	0	6	1	5	0	0
High	**10**	10	0	7	1	2	0	0
	59	44 (75%)	15 (25%)	23 (39%)	15 (25%)	10 (17%)	5 (8%)	6 (10%)

* Hotel, tourism, education, dental care, restaurant, hookah salon
** Transportation, logistics, legal and accounting, construction, real-estate services

Source: Developed by the author

In this study, 20 companies grouped into the first innovativeness category (IC-very low) included micro-companies in the retail and services sector (13 companies); small businesses that provided legal, transport or construction services to other businesses (3 companies); small companies that produced fashion clothes (3 companies); and one company engaged in the purchase and primary processing of meat using standard equipment. According to respondents, the main goal of these companies was to create value for the local consumer by selling traditional goods or providing services, which were usually adapted to the needs of a specific consumer group.

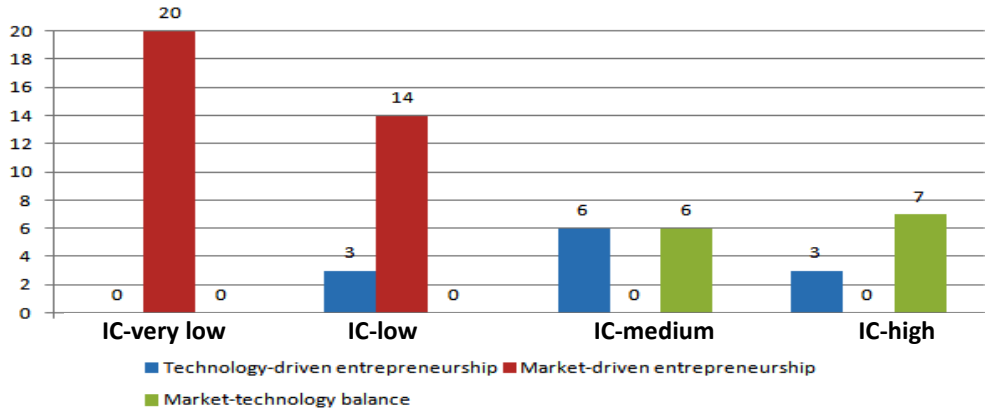
The second group (IC-low) included 17 low-innovation companies. These businesses focused on the creation of value for customers by adding certain characteristics to traditional products or services to enhance their value in the eyes of consumers. Respondents in this category perceived themselves as a necessary link in the value chain between larger businesses and customers in regional markets. Although technological solutions could be used by companies in both the IC-very low and IC-low categories, they were not subjected to serious improvements within the framework of these companies' activities.

The third group (IC-medium) included 12 innovative companies that exhibited medium level of innovativeness, which focused on adapting or improving existing technologies to better satisfy existing customer needs. In general, these companies were active on relatively new (but existing) regional or global markets, and offered customers solutions to their problems based on the application of a technology.

The fourth group (IC-high) included 10 highly innovative companies focused on implementing new or radically improved technologies to provide customers with products or services that were new and, at times, superior to all that had previously been available. The companies in this group offered new technological solutions on either highly modified markets, or new and emerging markets.

63% of SMEs in the sample had no novelty or a low degree of novelty in their businesses (traditional SMEs). As shown in Figure 3.3, the majority of traditional SMEs believe that their businesses' aim is to serve a particular client segment (answers to question 10). In contrast, most innovative SMEs are interested in commercialising a new idea or technology, or in using significantly improved technologies or approaches to offer better products or services.

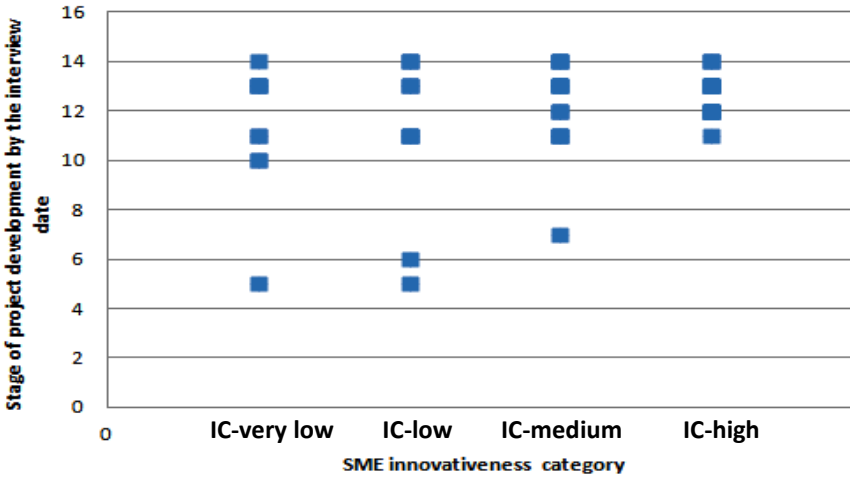
Figure 3.3. Distribution of respondents' answers in relation to their businesses' aims



Source: Developed by the author

92% of SMEs in the sample were in a "start of sales", "market penetration", "sales growth" or "scaling and diffusion" stage (see Figure 3.4). In other words, these companies had passed through the "valley of death" and were, therefore, able to characterise their networking experience in various stages of their companies' development. As such, these companies were relevant objects for the purposes of this study.

Figure 3.4. Distribution of respondents' answers relative to their business project's development stage

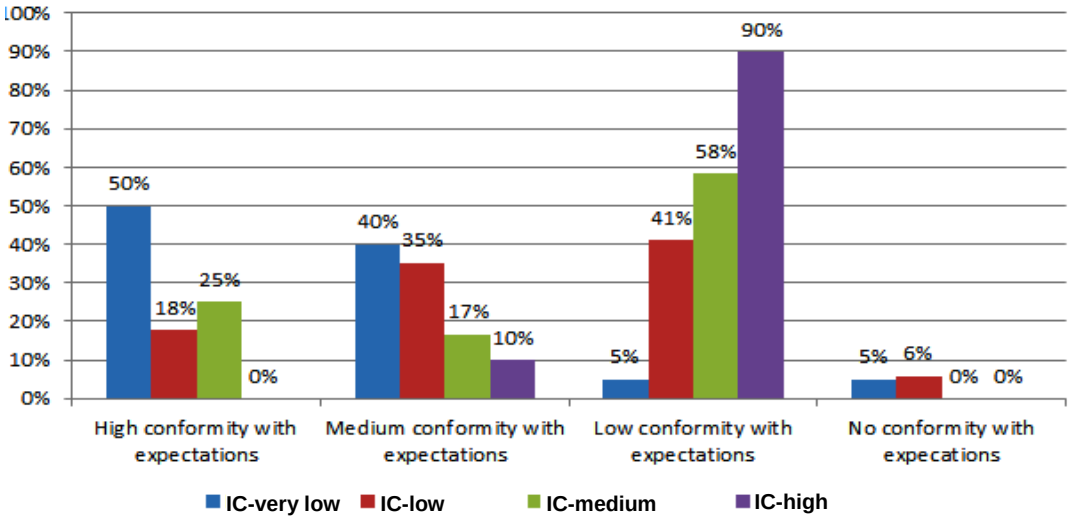


Stages: 1 - idea generation; 2 - idea verification; 3 – prototype; 4 - market evaluation, 5 - product/service development; 6 - minimum viable product; 7 -product validation; 8 - business-model design; 9 - engineering of product and business processes; 10 - company founding; 11 -start of sales; 12 - market penetration; 13 - sales growth; 14 - scaling and diffusion; 15 - business exit; 16 - other.

Source: Developed by the author

The degree of conformity between actual results and companies' plans was analysed. Areas examined in this regard included the appearance of initial clients and sales, expenses and income, and timeframes. Innovative companies showed more serious discrepancies between actual results and initial plans (see Figure 3.5).

Figure 3.5. Distribution of respondents' answers relative to estimation of business project's success

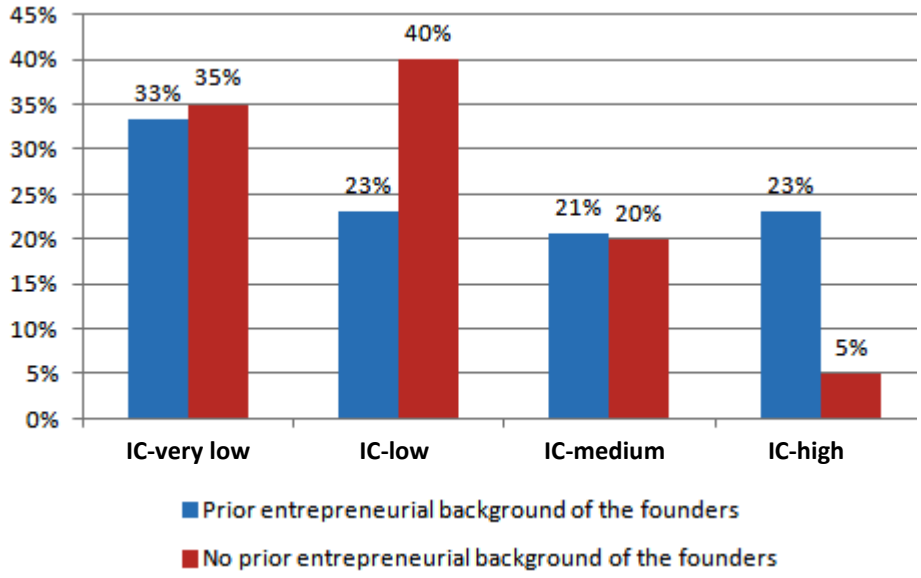


Source: Developed by the author

This observation indirectly confirms that innovative businesses carry more risk and are less predictable. Therefore, they involve more complex processes than traditional business. At the same time, 82% of respondents representing innovative companies (those with high and medium degrees of innovativeness) characterised their businesses as successful. These interviewees explained that even though their expectations had not been fully met, their projects were consistently growing and had significant market potential. Therefore, with the exception of the four businesses that had not yet passed through the "valley of death", the innovative SMEs in the sample can be viewed as representing the best entrepreneurial practices.

Interestingly, the difficulties associated with observing the timing of and plans for the introduction of an innovative product or service to the market could not be attributed exclusively to the founders' lack of entrepreneurial experience. As shown in Figure 3.6, more than 50% of founders of innovation projects already had entrepreneurial experience. However, the responses showed that the previous experience was concerned with high-tech business in only three cases. In the other cases, the entrepreneurs had experience with running a traditional SME.

Figure 3.6. Distribution of respondents' answers relative to founders' entrepreneurial experience

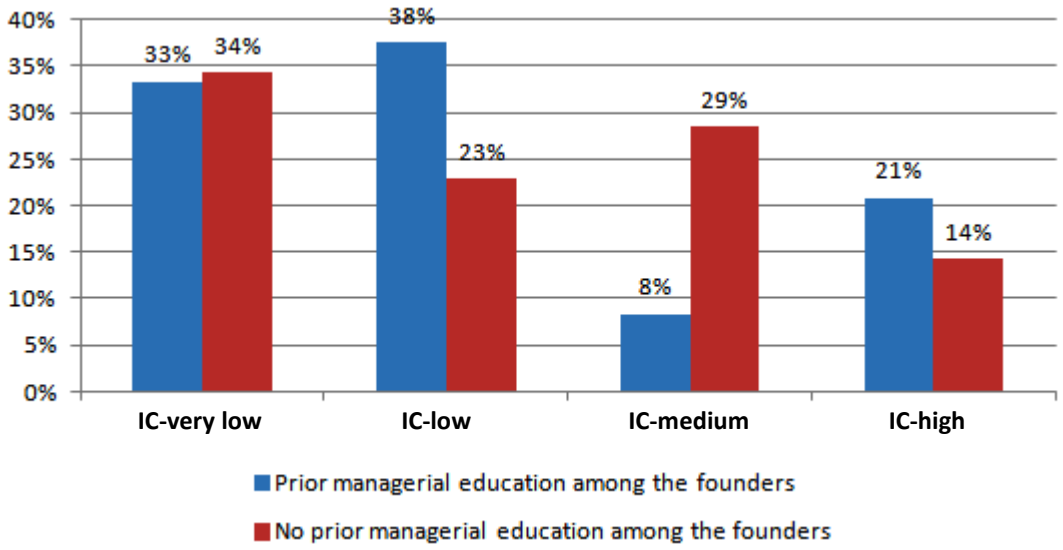


Source: Developed by the author

The same is true for management education. In general, given the data, it is impossible to say whether managerial education leads to more efficient introductions of innovative products on the market. The founders had completed a managerial education in 29% of the innovative companies (see Figure 3.7). However, the proportion of these cases in which there was a low degree of conformity between results and plans (about 70%) was equal to a

comparative sample of SMEs in which the founders had not completed this type of education.

Figure 3.7. Distribution of respondents' answers relative to founders' completion of managerial education



Source: Developed by the author

Therefore, the data indicate that the success of innovative projects does not necessarily depend on input indicators, such as entrepreneurial experience or managerial competencies. Instead, that success appears to depend on the actual process of building a business, including how entrepreneurs build networks to attract the resources they need. One can assume that experienced and inexperienced entrepreneurs, as well as entrepreneurs with or without managerial competencies, build networks in different ways, all of which aim to compensate for scarce knowledge, information and competencies. In this regard, the sample used in this study allows for the testing of propositions that reflect the research questions, as there is a sufficient number of SMEs in each of the innovativeness categories to use as a basis for comparing entrepreneurs' approaches to constructing and governing networks.

3.2.3. RQ1: What role does networking (external relationships) play in the founding and development of businesses in the Russian context in relation to their degree of innovativeness?

All 59 interviewees indicated that external relationships played a key role in building their business. The respondents' views, which are presented below, confirmed this idea. At the same time, they show that entrepreneurs from different categories perceived the importance of networking for the development of their business in different ways.

> I believe that external relationships played and still play a major role in building my business. I always clung to every piece of information on every contact. ... At the same time, I developed my network of business contacts not only at the beginning of my project when it was necessary to actively look for clients, but also throughout the business's expansion. (Svetlana, ASK-Capital, IC-very low)

> Building a network of business contacts is vitally important for our business. In general, we can say that our business was created thanks to the presence of business contacts. (Pavel, Dial-Electro, IC-low)

> Business contacts always play a significant role in the development of a product and its implementation on the market. We are convinced that the warrior cannot win alone. He can win with the help of an army. All of our partners and business contacts have common interests, so we are ready to unite our efforts. We believe that together we will get the result that we need and that these contacts will be really useful to everyone. (Daniel, Football Platform, IC-medium)

> This is an important component of our business process, because without these external relationships – without business contacts – nothing can be done in terms of the innovation business. It is like a separate managerial functional that must be dealt with. (Vladislav, Animo, IC-high)

In order to understand the specific features of networking behaviour in the different innovative categories, a set of questions must be answered:

- How do Russian entrepreneurs network?
- What contact sources are used and why?
- What aims do Russian entrepreneurs have when they engage in external relationships?
- How do Russian entrepreneurs govern their network of business contacts?

How do Russian entrepreneurs network?

The analysis of respondents' answers, which was performed separately for each innovativeness category, highlighted certain common features (see Table 3.12).

Table 3.12. Key characteristics of networking in the innovativeness categories

Innovativeness category	IC-very low	IC-low	IC-medium	IC-high
Major role of networking	A tool to attract and retain the client base, and build relationships with suppliers or, if necessary, with partners	A tool to attract and retain suppliers and partners, and build relationships with customers	A tool to attract the right contacts for development of the technology, to build production and to create a distribution system	One of the key business processes; a tool for converting an idea into a product/service that meets the requirements of a new market
Networking strategy	Snowball – starting with family, friends, and colleagues from university or work; expansion based on referrals and	Snowball – starting with relatives, friends, and colleagues from work; expansion based on referrals	Search for contacts starts with acquaintances and connections through the previous place of work; expansion	Key strategy is to become visible and known enough to attract contacts rather than search for them; search for

	recommendations; some interactions with other players in the industry with a view to jointly developing skills in the industry	and recommendations; key aspect is not the search for new contacts but the establishment of strong, reliable links that are the basis of the business; interaction with other industry players to share experiences	occurs through recommendations; active search and establishment of new professional contacts through open sources, industry exhibitions and other events; efforts to find the right contacts are planned; search for contacts for the target tasks of technology development, and creation and development of business; interaction with other players in the industry through sectoral and professional platforms and with state structures to develop industry professional standards	contacts starts with connections at the previous place of work; expansion continues through recommendations and professional networking events; rational planning of which contacts are needed and where to find them; active communication in all directions; active involvement in the activities of various sites for the exchange of industry, professional and entrepreneurial experience; creation of own platforms and sites for integration of efforts; interactions with other players in the industry, development institutions and state structures for the purpose of developing the market and popularising the industry

Source: Developed by the author

The respondents' views, which are summarised in the above table, suggest that innovative entrepreneurs understand the concept of networking far more broadly than non-innovative entrepreneurs in terms of its objectives and sources, as well as approaches to establishing and managing relationships.

> The essence of networking is the establishment of contacts with people. I believe that a person is a key resource in any business. Business – in general and in principle – is about people. Networking is a consequence of the fact that I am looking for new markets, new ideas and new experiences. ... It is like self-development, which is necessary for creating a big company. Of course, networking can offer both knowledge and connections useful for attracting resources that you lack. However, I am not always motivated by purely utilitarian goals. I generally like to communicate. I know how to do it and everything new is interesting to me. I believe that it is profitable to be generous. It is profitable to share. My experiences with people show that this often works. For example, I can communicate with a person without any desire to benefit at all, even in the form of simple advice. However, such a contact may, for example, later develop into a decent deal. I still live by the principle that any contact is useful and important. I generally try never to refuse communication and see how it goes. (Arthur, Directual, IC-high)

> A key role in the success of our business was played by business contacts. Without contacts, without suppliers, without subcontractors, what would the work have been? Of course, that work would still have been carried out, but at a very different pace. Therefore, in our case, it was important to enter the market precisely during the current crisis. Therefore, we entered the market in 2016, which was very helpful. All of our customers were very pleased with our

appearance, our offers, our prices and our price policy – all of us were delighted. (Alexey, Robotechnics, IC-medium)

The main business contacts for building our business were our partners. For example, if we needed some resources for development, we turned to our partners and asked them if they could allocate those resources to us. Some asked for something in return and some offered their help free of charge because they understood that we were connected in business – if we are able to develop, then they will be better off. (Anton, LKC-Advertising, IC-low)

I could not do all of this without the participation of my parents. They had friends who were engaged in business in this area with whom I could consult. I learned some details from them: how they started, what was required. We established contacts with our clients, of course, and established personal contacts with narrow specialists – first with the marketer and … with representatives of our beauty salon industry. (Mariam, Anin, IC-very low)

What contact sources are used and why?

The analysis of respondents' answers revealed some differences in the networking sources used to found and develop a business, as shown in Table 3.13.

Table 3.13. Role of primary contacts

Innovativeness category	IC-very low	IC-low	IC-medium	IC-high
Primary contact sources	Close personal circle: family, relatives, friends, classmates and close, former colleagues	Personal and professional circles: relatives, friends, former colleagues, associates and acquaintances at work, family to a lesser extent	Professional circle: former colleagues, old acquaintances from a professional environment; family, relatives and friends increasingly take on the role of moral support	Professional, scientific and business circles: former colleagues, old scientific, professional and entrepreneurial contacts; family, relatives and friends offer moral support
Role of contacts in creating a business	Contacts from close personal circle often serve as the motivation for creating a company; key role played by close relatives or friends who have successfully launched their own businesses	Contacts from the professional circle and the recommendations of relatives often serve as a motivation for creating a company; family members are less involved	Contacts with colleagues and acquaintances from previous professional circles often serve as a motivation for creating a company; recommendations from the professional environment play a key role in the acquisition of necessary contacts; in the case of relatively new technologies and markets, contacts are sought from open sources: professional exhibitions, conferences, LinkedIn, etc.	Often the motivation for creating a company is previous involvement in the sphere of entrepreneurship and a desire to engage in innovation (stimulated by participation in innovative activities); key role played by previous ties with colleagues and acquaintances from the professional, innovative and venture capital environments; given the high degree of business innovation, it is always necessary to seek and attract a large number of new contacts from different fields

Source: Developed by the author

The more complex and innovative the business, the more respondents stressed the importance of professional ties as a key source of relevant knowledge, skills and resources. The more traditional the business, the more important was the role of the close personal circle (family and close friends) in the provision of knowledge, skills and resources, particularly in the initial stages of company development. At the same time, all of the respondents stressed the importance of the provision of moral support and advice by personal circles (e.g., relatives, university friends and previous colleagues), as these circles generally had a high level of trust.

> If you worked with people before on some projects, you can always ask a question. You ask them to clarify something you do not understand or ask for advice. If you ask friends or relatives, you cannot be shy. ... It helps to protect yourself from mistakes, share experiences, say something aloud and understand it better. Through communication with people with whom you have something in common, you can test yourself and see new horizons. (Evgeniy, Giftery, IC-medium)

The lower the degree of innovation in a business in terms of both the market and the technology, the lower the need to attract new contacts and vice versa.

> Basically, when our project started, all of the key contacts had already been made. They became more active when needed." (Alexey, Robototechnics, IC-medium)

> "It takes at least one-third of our time or even half to find and build new contacts. I think this is because no one has done this before us, and we have to find and connect all of the necessary people in order to build the elements of our future project. It is like collecting bricks to build a beautiful building. (Vladislav, Animo, IC-high)

> We are making a new product. ... Most of the time, I am communicating with people ... although this happens in waves. You have a business hypothesis. You present it to people and, thus, start to test it. It takes almost all of my time. Then people tell you 'no, it does not work like that'. Then you go back, ponder and create a new hypothesis. In other words, for a period of time, you do not communicate very actively. Then you test the new hypothesis, maybe even with other people. You repeat all of this until you find out what the market needs. (Arthur, Directual, IC-high)

Respondents noted that contacts related to specialised skills are sought or updated as necessary. Such contacts are often needed to solve specific problems, and these interactions can be temporary.

> We are still looking for and taking scientists, doctors and candidates of science who can make a significant contribution and help improve our product." (Dmintry, Mereya Cosmetics, IC-high)

According to innovative entrepreneurs, one cannot thoughtlessly seek external relations for the sake of having contact with a famous person or gaining access to a desired resource. In their opinion, networking is always about mutual enrichment and mutual development.

> If you are talking about building external relations, you must try to find the people who understand you. Do not communicate with people who do not understand anything, even if they have the right resources, such as money. They can advise you, but they cannot provide

> the advice you really need. You need to look for partners whose interests coincide with yours in order to ensure synergies and joint development. (Evgeniy, Giftery, IC-high)

Individual respondents from non-innovative or low innovative companies also pointed out that external relations often lead to the development of new businesses aimed at the creation of something more innovative.

> Thanks to the contacts that we established through the development of this company, we developed an idea to create a new project. I think it will be something new on the market, and we plan to launch it together with one of our client companies during the summer. (Karen, Create Develop, IC-low)

The analysis of responses made it possible to compile the list of sources of external relations found in Table 3.14. The table also illustrates the frequency with which these sources were mentioned.

Table 3.14. Extended map of contacts

Innovativeness categories	IC-very low	IC-low	IC-medium	IC-high
Close personal circle				
Family and relatives	+++	++	+	+
Personal friends (former classmates from school or university, circle of friends with the same interests)	+++	++	++	+
Friends as a result of previous professional activities	++	++	+++	++
Professional circle				
Acquaintances from a professional environment	+	++	+++	+++
Clients	+++	+	++	+++
Suppliers	+	++	+	+
Partners	+	+++	+++	+++
Competitors/companies in the industry	+/-	+	++	+++
Professional industry associations	+/-	+	++	++
Industry exhibitions	+/-	+	+++	+++
Sectoral conferences, platforms for communication, hackathons	+	+	++	+++
State structures				
Regulatory state structures	+	+	+	+
Official industry bodies	+/-	+/-	++	++
Sources of external financing				
Private investors and business angels	+	+	++	+++
Banks	+/-	+	-	-
Funds (e.g., RVC, IIDF)	-	-	+/-	+++
Entrepreneurial support infrastructure				
State entrepreneurial support systems	+/-	+/-	+/-	+
Entrepreneurial conferences, forums (private initiatives)	-	-	+	+
Co-working	+/-	+	++	+
Innovation support infrastructure				
Accelerators	-	-	+/-	+++

Incubators	-	-	+/-	++
Technoparks	-	-	+/-	+++
State development institutions (e.g., Skolkovo, RVC, RUSNANO, ASI)	-	-	+	+++
Innovative forums	-	+/-	++	+++
Scientific environment				
Educational or academic research institutes and organisations	-	+/-	+++	+++
Branch R&D organisations	-	-	+	++
Academic scientific conferences	-	-	+	+
Programmes of interaction between science and business (e.g., Innopraktika)	-	-	-	++
Internet				
Social networks				
LinkedIn	+	++	+++	+++
Facebook	+++	++	+	+++
Instagram	+++	+	+	+++
VKontakte	+++	+	+/-	+
Bloggers	++	-	-	+
Internet promotion tools	+++	++	+	+/-

+++ Very frequently (mentioned by more than three respondents); ++ Frequently (mentioned by three respondents); + Rare (mentioned by two respondents); +/- Very rare (mentioned by one respondent); - Never (not mentioned)

Source: Developed by the author

The analysis of respondents' answers also allowed for identification of the key objectives entrepreneurs pursued when entering into external relations with a particular source, as presented in Table 3.15.

Table 3.15. Purposes of networking with different sources

Source of networking	Purposes of engaging in networking
Close personal circle: family, relatives and friends	Moral support, including motivation to achieve results; opportunity to discuss emerging ideas for creating a business; advice (useful, intrusive or misleading); selfless assistance in attracting necessary resources (through referrals, recommendations for establishing contacts with the right people, provision of initial capital); sometimes these contacts become co-founders
Former colleagues, associates and acquaintances made during a course of study or at work	Professional knowledge and competence; willingness to become a co-founder or assistant in the creation and development of the business; readiness to recommend a good source of information and contacts, and to refer the entrepreneur to the right people; opportunity to ask for advice and get an initial consultation at no cost
Acquaintances from a professional environment	Expert knowledge of technology, industry contacts, recommendations
Service companies	Access to services related to the coordination and obtaining of permissions for doing business, the opening of the company, legal support and intellectual property rights protection, as well as services in the field of marketing and promotion
Government bodies	Methodological recommendations on building a company in a particular business sector, advice on compliance with requirements,

	state support for establishing links with the market and potential consumers
Institutions of development (e.g., Skolkovo, RVC, RUSNANO)	Reputation, prestige, grants, tax benefits, assistance with access to international markets (institutional and organisational, communications, contacts)
Venture funds (e.g., RVC, IIDF)	Investments, acceleration, market expertise
Venture environment	Access to financial resources through business angels, venture funds, pre-seed and seed funds, crowdfunding
Banks	Access to bank loans
Accelerators	Offsite and and full-time acceleration programmes (e.g., GenerationS, IIDF)
Technopark	Tax incentives; benefits related to the cost of renting premises; legal and information support; development-related environment, including activities and programmes for innovative entrepreneurs
Co-working	A convenient form of organisation of the working space; an innovative environment of one's own, which makes it possible to follow modern innovation trends
Parent company, strategic partner	Market expertise; research and development complex; access to means of experimental and mass production; market contacts, including sales channels; accounting services; office for work
Industry conferences in the relevant to business field	Understanding the market (development features, key players, technologies), potential strategic partners, potential customers
Specialised professional events, exhibitions, hackathons	New trends in technology, marketing, personnel management; new technological ideas; new strategic vision; etc.
Private educational entrepreneurial initiatives	Opportunity to quickly obtain missing knowledge related to building and developing the company; form a narrowly-focused competency, such as the ability to promote a product/service on the Internet
Scientific institutions, higher-education organisations	Expertise; structured, scientific, contemporary knowledge; scientific developments, including patented technologies available for commercial implementation; opportunity to find promising employees for research and for business development
Economic and business forums	Opportunity to learn about economic development trends, new business models and management features related to the company's activity; opportunity to meet similar entrepreneurs and exchange experiences, and to find team members and necessary specialists
Innovative conferences and events	Opportunity to meet mentors, potential investors, new team members or necessary specialists with a similar innovative mindset
Industry or professional communities (virtual or real)	Joint development of the industry, testing of ideas concerning the business, customer development
Social networks (e.g., Facebook, LinkedIn)	Promotion of oneself as an active member of the community, contacts, the ability to quickly find the right competencies
Bloggers, opinion leaders	Create a positive reputation for a company/product through the influence exerted by opinion leaders in their personal blogs

Source: Developed by the author

When asked about contacts needed to build a business, many respondents highlighted the importance of the sources used to establish a company. Respondents, especially in the IC-very low and IC-low categories, pointed out that friends from school or former colleagues often became co-founders of their businesses. They also noted that mixing personal and business interests while founding a company tended to harm friendships and led to problems in doing business. Several respondents said they had parted with their co-founders, thereby losing friendships. At the same time, several respondents indicated that they had founded businesses with former colleagues with whom their relationships were not so personal. Notably, this did not lead to problems in conducting business.

> Mereya Cosmetics is not my first business project. Previously, we started all of our businesses with our friends. We then closed them within two or three years because we severely disagreed with each other. At times we even quarrelled. We lost friends because of money. This is very disappointing because, for me, friendship is more valuable. Now I better understand this fine line, and I try to be extremely cautious and neat in this regard. I try to think about these questions in a better way. Sometimes I just do not engage friends so that I do not lose them. It is better to launch business with acquaintances than with friends. ... If we start a project together, then we need to negotiate the rules of the game before we start. (Dmintry, Mereya Cosmetics, IC-high)

What aims do Russian entrepreneurs have when they engage in external relationships?

The analysis of responses also allows for the goals that entrepreneurs pursue through external relationships to be mapped. Although the grouping of companies into innovativeness categories proposed in this study was meaningful in terms of ordering them from less innovative to more innovative, it did not lead to the formation of a non-intersecting breakdown of the data sample into mutually exclusive groups, as some respondents' answers were similar to those of respondents in other categories (see discussion in Section 3.2.1 In particular, the intersection in respondents' answers regarding innovation was also evident in the intersection of their answers regarding the goals of networking. In Table 3.16, the column boundaries have been placed in a way that visually reflects this situation.

Table 3.16. Map of goals pursued by entrepreneurs in external relationships

Non-tech companies		High-tech companies	
Innovativeness categories			
IC-very low	IC-low	IC-medium	IC-high
▪ Meta-task: Creation and maintenance of loyalty of the client base	▪ Meta-task: Creation and development of reliable relations with partners in the vertical of business interaction	▪ Meta-task: Build customers' and partners' perceptions of the company as a highly professional organisation	▪ Meta-task: Build partners' customers', potential clients' and the wider community's perceptions of the company as an innovative entrepreneurial organisation
▪ Attract customers			
▪ Attract missing resources			
▪ Choose the best suppliers in terms of quality and reliability			
▪ Obtain the necessary knowledge in the field of doing business			
▪ Interact with government agencies to obtain the necessary permits to conduct business and ensure compliance with official requirements (e.g., tax payments, financial reporting)			
▪ Interact with the service providers engaged in the development of Internet sites, marketing and Internet promotion; in rare cases, non-innovative and highly innovative companies address the goal of Internet marketing partially or completely on their own without involving a wide range of external contacts			
▪ Search for and repair necessary premises located in places where goods and services are consumed	▪ Rental of office, retail and service premises to ensure ease of access for customers	▪ Rental or placement of own offices and R&D premises to ease technological development and production; sometimes located close to a scientific or strategic partner	▪ Search for premises that provide an opportunity for research and product development; in early stages, co-working facilities can be used; later, offices are generally located in a technopark or on the premises of a strategic partner that also allows the business to use its production capacities
▪ Search for and attract employees based on recommendations from existing contacts		▪ Search for and attract employees on the recommendation of people in the professional circle, and through contacts with higher-education institutions, professional associations and platforms	
	▪ Build relationships with partners in the industry, mainly to exchange experiences, develop industry skills and co-create new trends	▪ Build relationships with partners and competitors in the industry and government, mainly to improve the level of professionalism and industry regulation, including creation of barriers to entry for new players	▪ Build relationships with partners, competitors in the industry, and a broad community that includes public and private commercial and non-profit institutions, mainly for the purpose of creating, developing and promoting innovation in the industry
	▪ Build relationships with partners in related industries		
	▪ Creation, development and expansion of the client base		
	▪ Acquisition of knowledge and skills to improve the business model and technology		
▪ Advertisement and promotion of goods and services, stimulation of repeat purchases		▪ Build company brand awareness	
		▪ Build founders' professional reputations and a reputation for the company's management	
		▪ Build entrepreneurial reputations of the individual founders and management of the company	
▪ Product improvement		▪ Product development	
		▪ Interact with scientific and research organisations with the aim of developing and improving technology	
▪ Development of customer satisfaction			▪ Customer development
	▪ Embed in activities conducive to the development of a start-up		▪ Create an environment conducive to the development of a start-up
▪ Build a community of people that constitutes an environment for personal and professional development of an entrepreneur	▪ Integration in the community of people who contribute to the personal and professional development of an entrepreneur		▪ Build a community of people that constitutes a comfortable and stimulating environment for the entrepreneur's personal existence

Source: Developed by the author

This map presents a range of goals that might be reached with the help of networking. It does not indicate their logical sequence, which, judging by the respondents' answers, depends more on industry specifics than on belonging to a certain innovativeness category. Interestingly, the non-tech companies in this study were more inclined to build their business starting from the goals in the upper tiers and moving down. In contrast, high-tech companies, especially IC-high companies, typically moved from the lower tiers to the upper ones, and then circled back again to the lower tiers, as innovative companies needed more than one iteration to create a commercially successful version of their product or service. This map clearly shows that the higher the degree of innovativeness in a firm, the wider the range of goals that it solves with the help of networking. At the same time, the essence of some types of activities changes depending on the company's degree of innovativeness (as shown in Table 3.17). As such, those activities require fundamentally different approaches to networking.

Table 3.17. Examples of changes in business objectives with the growth of innovativeness that require changes in networking behaviour

Traditional SMEs	Innovative SMEs
Search for and attract employees based on recommendations from existing contacts	Search for and attract employees on the recommendation of people in the professional circle, and through contacts with higher-education institutions, professional associations and platforms
Product improvement	Product development
Development of customer satisfaction	Customer development
Embed in activities conducive to the development of a start-up	Create an environment conducive to the development of a start-up

Source: Developed by the author

In principle, the knowledge that higher degrees of innovation require different types of networking is important for making managerial decisions. Although this study's fuzzy approach to grouping does not clearly indicate the moment at which a networking strategy should change, the meaning of this finding remains valid for two reasons. First, no abstraction is identical to reality (Swedberg, 2018), as an abstraction cannot cover all factors. Therefore, in practice, all theories should only be applied by managers after taking the characteristics of the firm and its environment into account. In other words, a firm must decide which strategy suits it best given the benefits and costs of networking. Second, the application of networking approaches characteristic of highly innovative firms is likely stimulate innovation in firms of other types and, thereby, allow them to more effectively solve business problems given the high uncertainty evident in the Russian business environment.

How do Russian entrepreneurs govern their network of business contacts?

Entrepreneurs belonging to different innovative categories build their networks of contacts in different ways to solve the range of tasks they faced. Naturally, one might then wonder whether companies in different innovativeness categories adopt different approaches to governing those networks.

The first interviews indicated there are differences in how entrepreneurs in all innovativeness categories governed their relations with customers and suppliers/partners. As such, in order to more clearly identify differences in approaches to governing networks among entrepreneurs in different innovativeness categories, their approaches to managing customer and partner relations must be examined separately. However, some respondents, especially those representing non-tech companies, struggled to separate the methods they used to manage relationships with these two groups. Therefore, the interviewer asked clarifying questions, through which the existence of differences was confirmed. Interestingly, in the course of talking with the interviewer, few respondents noted that their companies had computerised customer relationship management (CRM) systems. This was the case for several respondents in the IC-low and IC-medium categories. Most respondents stated that they did not need to use complex tools due to the existence of a relatively small client base. Some respondents said that they tried to conduct work systematically based on CRM principles even though they did not use computerised CRM systems.

> We already have more than 1,500 client contacts. We check the activity of our Instagram page visitors, and we check how many people are watching our publications on the social network Vkontakte. We monitor the number of customers who visit our sales offices and our web catalogues, and we monitor what they are looking for, what they choose and what they like best. On this basis, we form proposals for future apparel collections. However, we do not have a specific database. We do not even use a CRM system. (Olga, Branding, IC-very low)

Some respondents demonstrated an intuitive, non-reflexive understanding of how they managed their networks. For a number of entrepreneurs, especially those belonging to the IC-very low category, the question about approaches to network governance caused confusion.

> Question: Please describe how you manage your network of business contacts.
>
> Respondent: I do not know how to respond. (Vladislav, Bouquet-77, IC-very low)
>
> Respondent: I do not know. ... Everything is really chaotic. (Vyacheslav, L'azur, IC-very low)
>
> Respondent: I would not say that I have a clear algorithm of action. It is desirable, perhaps, to enlarge my contact base. Well, for me it is, as for any businessman, very important. I am surprised that I have not previously thought about this. (Robert, Loft, IC-very low)

At the same time, experienced entrepreneurs (serial entrepreneurs, mentors) valued systematic approaches to finding and governing business contacts. These respondents highlighted the stages of creating, developing, maintaining and ending relations with participants in their networks.

> We organised a strategic session in May 2016. We formulated a number of tasks that needed to be addressed to create our start-up. Then we decomposed what we needed to do to address those tasks, and we decided on the people with which we needed to become acquainted and the people with which we wished to enter into closer contact. ... We made one person responsible for each category of contacts. Then, once a week or every two weeks, we sat down and discussed who had done what in relation to approaching those contacts. (Andrey, Motorika, IC-high)

> That is what you need to teach – how to properly establish relationships in business, how to develop them, maintain them and end them if necessary. We do not know how to do this in Russia. (Andrey, Motorika, IC-high)

The non-reflexiveness demonstrated by respondents with regards to their network-governance behaviour created difficulties in the interview process, as it required the interviewer to ask additional probing and clarifying questions. However, if the interview was the first time respondents actually considered these questions, then they had no opportunity to distort the data or present the socially desirable picture instead of the real one. Interestingly, after some of the interviews, respondents thanked the interviewer, stating that the interview had helped them uncover ways of improving the building and governing of their business networks.

The results of the analysis of the governance of contacts with clients are presented in Table 3.18.

Table 3.18. Customer-relationship governance

Innovativeness category	IC-very low	IC-low	IC-medium	IC-high
Attitude toward development of contacts with customers	▪ Formation of loyalty and retention ▪ Customers are main key contacts	▪ Ensure the inflow of customers ▪ Optimise the customer portfolio	▪ Attract customers and build relationships with them ▪ Willingness to invest in the training and development of customers to enable them to use advanced technologies ▪ Usage of customer feedback to expand services, improve products and establish cooperation with customers	▪ Search for a niche in which there are loyal customers who understand the utility of a new product/service and share the company's values; build a partnership with clients to create a new offer or radically improve a traditional product
Customer-acquisition	▪ Company website ▪ Company page on	▪ Different types of advertising	▪ Use of image-reinforcement and	▪ Widespread PR campaign and

channels	social networks ▪ Promotion through the Internet ▪ Personal pages and blogs of entrepreneurs in social networks	▪ Company website ▪ Company page on social networks ▪ Promotion through the Internet	PR activities to attract clients ▪ Professional trade fairs and exhibitions ▪ Professional portals ▪ Company website ▪ Company page on social networks ▪ Promotion through the Internet	company promotion through the Internet ▪ Professional industry and innovation exhibitions and events ▪ Company website ▪ Company page on social networks ▪ Promotion with the help of opinion leaders (bloggers) ▪ Personal pages and blogs of entrepreneurs in social networks
Dynamics of client-based formation	Phased development of client base: ▪ Sharp growth of client base due to special efforts to attract customers ▪ Maximise number of clients and understanding through experience with how many customers can be serviced by the company ▪ Reduction of the customer base to achieve manageability with a focus on retaining loyal customers	▪ Constant process of attracting customers and establishing services ▪ Interest in maintaining client inflow ▪ Acceptance of the fact that some customers will leave and new customers will take their place ▪ Pace of developing the client base is initially high but then slows	▪ More individualised approach to customers aimed at building long-term relationships with customers ▪ Customisation of the product/service and the service process ▪ In the initial stages, personal relationships with customers; in later stages, relationships become more formalised (e.g., support provided through the Support Department)	▪ Gain the client and obtain client's direct involvement in the process of creating a new product/service ▪ Constant development of the business-contact pool, which can generate client leads in the future ▪ Build relationships aimed at ensuring customer loyalty
Customer-relationship governance	▪ While forming the client database: personal involvement of the entrepreneur in attraction (e.g., meetings, calls, letters) ▪ Development of customer relationships is part of the daily work of the entrepreneur; supported by steady, positive experiences of interaction between the client and the company ▪ In subsequent stages, entrepreneur's participation in maintaining relations is important (e.g., calls, birthday and holiday greetings) ▪ Day-to-day	▪ In early stages, entrepreneur contributes to attracting key clients (e.g., meetings, calls, letters) ▪ Entrepreneur involved in the construction of a system for attracting customers and monitoring the effectiveness of servicing clients ▪ Signing of standardised contracts ▪ In later stages, entrepreneur participates in developing relations with key clients at the top management level ▪ Organisation of client events in order to maintain good relations	▪ Entrepreneur's contribution consists of establishing contacts with strategically important clients ▪ Company has a department responsible for customer relations, including account managers engaged in negotiating and agreeing on contract terms, monitoring success, etc. ▪ Entrepreneur participates in developing and maintaining relations with key clients at the top management level, as this affects the desire of customers to recommend the	▪ Entrepreneur active in the process of attracting early adopters ▪ Build relationships with the first customers, who can later serve as ambassadors for an innovative company

	maintenance of relationships transferred to staff over time	▪ Day-to-day maintenance of relations with customers entrusted to staff	company ▪ Build and maintain relationships with customers by participating in professional exhibitions and trade fairs as an exhibitor ▪ Monitoring of the success of the customer-relationship governance system	

Source: Developed by the author

This table shows that, in general, a more systematic approach to governance of customer contacts was demonstrated by companies in the IC-medium category than by IC-low companies. In the former group, the role of the entrepreneur focused more on building relationships at the strategic level, and on establishing and monitoring the system of customer interaction. At the same time, the functions related to maintaining contacts were assigned to relevant specialists in the company. The entrepreneurs most deeply embedded in building and maintaining relationships with customers were found in the IC-very low and IC-high categories.

The results of the analysis of the governance of contacts with suppliers and partners are presented in Table 3.19.

Table 3.19. Governance of contacts with suppliers and partners

Innovativeness category	IC-very low	IC-low	IC-medium	IC-high
Key principle of partner selection	▪ Cooperation with those who make the best offer at the lowest price ▪ Do not work with those partners that are not liked on a personal level	▪ Strong potential for long-lasting and reliable relations	▪ Potential for contribution to product/service development ▪ Professionalism	▪ Synergy potential ▪ Sharing of values
Attitude toward development of contacts with partners and suppliers	▪ Large number of contacts made at the recommendation of those in the entrepreneur's close, personal circle ▪ Major business connections are among suppliers ▪ Number of partners is insignificant; communications are established with them if they are strategically significant	▪ Recommendations are of great importance, as they form the basis of trust when establishing new contacts ▪ At the heart of relations with partners is the planning of activities; clarifying obligations and responsibilities, and ensuring they are clear in the contract	▪ A large number of contacts are related to previous professional activities ▪ Active search for new contacts who can help in the development of technology (as needed) ▪ Search for necessary contacts is the responsibility of co-founders, as they have the	▪ Important to become the centre of attention and the integrator of the efforts of many partners from various spheres ▪ Systematic attitude toward the development of external relationships ▪ Search for contacts is the responsibility of the founder and all members of

	▪ Emergence of new strategic partners can lead to expansion/ diversification of business ▪ Analysis of the results of interactions with customers can lead to a decision to optimise the business model to improve operating performance, especially by changing a supplier or partner	▪ Desire to establish personal relations with partners as a necessary addition to signing contracts, as doing so ensures more precise implementation ▪ Number of partners is not very large, so the entrepreneur must be personally involved in relationship governance ▪ Strong relationships with partners are the main asset	necessary expertise to assess the potential ▪ Contacts often sought in connection with a need to expand the project ▪ Involvement with some contacts can create barriers to business development	the start-up team ▪ Look for contacts likely to be useful in the future ▪ Acceptance of the fact that only 3% of contacts will be useful ▪ Many "sleeping" contacts
Dynamics of the formation of relations	▪ Circle of contacts changes with the resolution of urgent tasks (e.g., from contractors for office repair to the advertising and sales channels) ▪ As soon as a contact's relevance is lost, the relationship fades away ▪ In the period of business formation, the number of suppliers grows ▪ In the period of business stabilisation, relations are maintained ▪ Composition of the pool of suppliers is reviewed and optimised based on explicit criteria (e.g., price, quality, reliability)	▪ Evolutionary development of the network of contacts ▪ Slow expansion – as new tasks arise, new contacts are needed ▪ Active participation of the entrepreneur is critical for entering a new level of relations with partners	▪ In the initial stage, number of new contacts increases at a faster rate ▪ Natural evolution, such that some contacts fade and some intensify owing to new opportunities for the development of key technology ▪ Generally smooth expansion of the network of contacts ▪ Quick development of the network with partners when expanding the scope of business activities	▪ Constant, active and systematic work on attracting new contacts ▪ Constant expansion of strategic contacts ▪ Emergence of new contacts attracted by the innovative activities of the start-up ▪ Need to end certain relations in the correct manner, especially relations with state structures
Governance of relations with suppliers and partners	▪ Entrepreneur is personally involved in the search for and selection of suppliers ▪ Entrepreneur participates in the development and maintenance of relations ▪ Personal friendships are built with key suppliers and strategic partners ▪ Maintenance of relations with key suppliers and	▪ Creation, development and maintenance of relations with partners are important parts of entrepreneur's daily work ▪ Goal is to build trust-based relationships with partners, which serve as the basis for long-term cooperation ▪ Maintenance of relations is a planned activity;	▪ A large number of active contacts are inherited from previous professional activities; therefore, participants in these relations are loyal and contacts are maintained through natural communications ▪ If necessary, old links are activated ▪ New contacts are of a professional	▪ Proactive position in relation to key strategic contacts: search, development and maintenance of relations ▪ Communication with sleeping contacts occurs as needed ▪ Establishment and development of contacts is the responsibility of the entrepreneur and team members; some

	strategic partners remains the personal responsibility of the entrepreneur; carried out through personal correspondence, meetings and visits ▪ A warm relationship is maintained with other suppliers (e.g., greetings on holidays, periodic contact)	occurs through personal correspondence, phone calls and meetings ▪ Operational everyday interactions are carried out by company managers, who solve tasks related to their competencies ▪ Relations with contractors are generally more formalised; the contractor who gives the best offer at the best price is selected ▪ Relationships also maintained through participation in professional exhibitions and trade fairs organised by partners, usually as visitors with the purpose of communicating with partners ▪ Overly close relations with partners might pose a threat if they involve expectations of favourable treatment, which might negatively affect profitability	nature and are based on the mutual interests of the participants; these are maintained in a reciprocal manner ▪ A number of contacts become barriers to development because they have outlived their ability to contribute to the development of the technology or product; such contacts must be ended ▪ Participation in professional exhibitions as an exhibitor; used to build and maintain relations with partners	contacts develop into friendships ▪ The building and maintaining of relations with partners often occurs through participation in professional industrial, entrepreneurial and innovative forums (e.g., as speakers), and through the organisation of events and platforms to initiate communication with a broader base ▪ Responsibility for the implementation of interactions with contacts and the maintenance of relations can be delegated to a specialist in the company

Source: Developed by the author

The respondents' answers suggest that companies in different innovative categories exhibit different patterns of creating and governing networks of contacts with partners. Moreover, the number and variety of those contacts increase as the degree of innovativeness increases. For example, companies in the IC-very low category, which have businesses that are built on customer relationships rather than relationships with suppliers, rationally select and build relationships with those suppliers that most closely match their criteria. Moreover, the size of these companies' networks tends to stabilise over time.

> We always evaluate all of our suppliers at the end of the year. We examine who gave us the most revenue and the least problems, and we eliminate problematic companies. We try to work with those companies with which it was comfortable, convenient and profitable to cooperate, and which provided the required quality. (Andrey, Mirko, IC-very low)
>
> I have already stopped looking for contacts because we are happy with what we already have. We do not have time to process all of the contacts that come to us. While I did not

> make such a decision, I did spend a lot of time on useless contacts. Imagine spending time on negotiating and reaching an agreement, and then not being able to work because you do not have enough hands and heads to do so. (Alena, SV Group, IC-very low)

The companies in the IC-low category demonstrated a high degree of involvement in building reliable, mutually beneficial relationships with partners. At the same time, the companies in this category paid the most attention to the formalisation of relations and contractual obligations. This networking behaviour might reflect the fact that these companies primarily built their businesses on links with their partners. On the one hand, they wanted to rely on partners' brands and reputations for building their own business, and they needed formal permission to do so. On the other hand, they wanted to be sure that their partner companies would not replace them with others and that they would not be thrown out of business. For these reasons, companies in this category paid a significant amount of attention to formalising relationships with partners.

> While creating our business with partners, we communicated quite often and on a personal level. There were many personal meetings and a lot of correspondence. I am currently handling this – not my subordinates. I have constantly communicated up to this point because building and maintaining relations with partners are key activities in our business. (Olga, Language Profi, IC-low)

> For example, we are already selling such high volumes of motor oil that we are worthy of a certain status, not just as a buyer but as a direct client of the Castrol company. Therefore, the goal is to establish contacts with Castrol's management, to discuss special conditions for our business and to sign the relevant contracts. (Andrey, Avto-Okey, IC-low)

> To develop our business, it was very important, for example, to conclude contracts with the market leaders in the lighting-equipment sector. These contracts are now being carried out, certain plans are being put in place and the results are becoming evident. I believe that this is the ideal scenario for us. (Pavel, Dial-Electro, IC-low)

Unlike non-tech companies that mostly built vertical relationships with partners and suppliers, and rarely established horizontal relationships with representatives of their own or related industries, companies in the IC-medium category had more horizontal links in their own industry and related industries. Entrepreneurs in this category establish these external relationships in order to refine and commercialise their key technologies. These contacts are mainly sought out through existing professional channels, which act as guarantees of reliability and professionalism for these new relations. As the contacts in an individual's professional circle are relatively close and based on mutual interests, the tools of relationship governance are aimed at maintaining a presence in a real or virtual professional environment, with the purpose of reminding interested parties about a company's professional achievements and its willingness to engage in cooperation if a common interest appears. In other words, the focus is not necessarily on traditional tools for building relationships, such as personal meetings or correspondence. It is much more

important to meet periodically at professional exhibitions, key trade fairs, industry forums and professional networking events.

> In general, I can say that the number of our business contacts increases steadily. For example, when new projects appear and we do not have enough capacity, someone on our team usually has an important contact – he might know of a good specialist who does about the same and who has his own team. We can then draw that team into our project. (IE Afonin, Anton, IC-medium)

> Basically, the contacts necessary for building the business were my personal, professional ties. These were my acquaintances with whom an interest in this matter coincided, so there was no need to manage relationships in that regard. Mutual professional interest alone controls our relationships. No additional stimulus is needed. (Alexey, Robotechnics, IC-medium)

> I regularly attend thematic professional exhibitions and various Internet forums dedicated to my professional topics. At those events, I can position myself to be seen as a specialist and not be forgotten. Moreover, interesting contacts can sometimes be found at those events. If necessary, we will use them over time. (Alexey, Robotechnics, IC-medium)

As the analysis of respondents' answers showed, the attitude of innovative start-ups toward the role of networking in the establishment and development of a business differs significantly from the understanding evident in other categories. For innovative companies, networking is one of the key processes that determine the development and creation of an innovative business. At the same time, these companies not only wish to increase the number of contacts in their networks but also to develop those relationships to ensure the maximum synergistic effects.

> The pool of business contacts must be constantly developed. The most important rule in business is also applicable to networking: any stop is death. As soon as you stop, you start to sink. It is like in the ocean – while you are floundering, you are swimming and you are still on the surface; but as soon as you stop, you begin to quietly sink under the weight of your entire network. (Arthur, Directual, IC-high)

> The development of a contact involves an increase in the number of communications and results achieved within one specific connection between two people. (Andrey, Motorika, IC-high).

In the initial stages of founding a company, it is necessary to understand the spectrum of business tasks for which external contacts will be required. It is also important to be aware of sources for these necessary contacts.

> We knew what we needed and understood where to find contacts with the right people, which allowed us to develop quickly. (Vladislav, Animo, IC-high)

In the opinion of the innovative entrepreneurs, a partnership must be governed. That governance should include the creation of a positive emotional environment and additional value for the partner.

> When we talk about managing relationships with partners, we refer to our constant efforts to inform them, send them special offers, thank them and reward them. To do so, we organise special events for them or other participants in our network. (Andrey, MasterSlavl, IC-high)

Respondents representing IC-high companies pointed out that contacts can be characterised as either important, strategic contacts that are always being sought out, or horizontal, professional contacts. The development of strategic contacts requires time and effort, including a mutually beneficial exchange of information and the creation of value for those key contacts. Such contacts can play an important role in the business's future growth.

> Key contacts are 'important people'. Their strength lies in the fact that they have great experience, high positions and social status. They also have large networks. In other words, they are authorities in their professional fields and authorities as people. These contacts need to be monitored. You need to periodically remind them of your existence and manage them. ... If people are in a horizontal connection with me, we just need to maintain good relations. There must be symmetry. If I need something, I will write to them. If they need something from me, they write to me. (Arthur, Directual, IC-high)

The analysis of respondents' answers suggests that an innovative start-up is usually characterised by an active public position, which is aimed at attracting attention. This allows the start-up to create a situation in which a number of high-quality contacts might approach it on their own.

> We are purposefully looking for some contacts and some contacts join us themselves. We just go our own way and they join us. If our business is right, then everything happens smoothly. For example, we believe that the idea behind our product is so strong that investors will find us. For example, we did not beg anyone – the venture funds came to us. ... We just agreed to cooperate. (Dmintry, Mereya Cosmetics, IC-high)

Furthermore, contacts who are interested in the start-up's progress can help in the development of the necessary links.

> When we achieved our first results and we had to move on, our partners from the venture fund said that they had acquaintances in beauty salons. They suggested approaching them to test our product. ... We arrived and our product was shown. In general, professionals liked what we did. They gave us recommendations on how to improve our product and said that they need to know how to use it. (Dmintry, Mereya Cosmetics, IC-high)

Active start-ups are able to involve people who can highlight necessary actions and developments about which the start-up might be unaware.

> At every stage in the company's development, both in my experience and in the experience of my partners, there have always been some people who, in principle, formed us, helped us and guided us. Some experts or experienced entrepreneurs appeared in our field of vision. With some, we have maintained a relationship. With some, we have even become friends, while some played a role and walked away. There was a terrific person, a potential investor – he never invested because he did not understand our business idea. He was a tough guy, but he gave us a lot in terms of experience and expertise, which we then happily used. I am very grateful for this, but we do not communicate with him right now. (Arthur, Directual, IC-high)

More experienced entrepreneurs and mentors noted that relationship governance is a separate function in the management of a newly created company that requires both time and certain professional skills. In some cases, this function is transferred to specific employee.

> Establishing and developing contacts is my task and the task of other members of the team. Maintaining relations means communicating with someone about certain operations, such as participating in a contest. For these operations, intense communication and significant effort are required, and the skills needed are all of a technical nature. I believed that it was too expensive to use my and other team members' resources to perform this technical work. Then a special person appeared. ... He was employed and was told: 'Your KPI is the attraction of micro-grants. You are leading this process'. Then we gave his name to the corresponding event coordinator, and he went there, represented our project and established the necessary contacts. However, first we trained him on making an investment pitch. He practiced the pitch in front of us until we were convinced that he could do it as well as we could. (Andrey, Motorika, IC-high)

In addition to the natural completion of relations due to the fulfilment of relevant tasks, there were situations in which certain efforts were required to exit a relationship because it became undesirable or even dangerous. One example of such a situation was given by a respondent who represented the radically innovative project Motorika.

> As the start-up becomes increasingly noticeable in media, the number of those who want to lean against it, especially in the state structures, rises. After all, they also need to report on the results achieved and show the project, the success of which was the result of the support they provided. Then their competitive struggle begins and you become a bargaining chip. You have to make decisions about which actors are important. As a consequence, there is a group of relationships that deteriorate. People representing some state structures initially maintained relations and applauded us when we presented at an innovative forum. However, at some stage of development, we made a decision that was not in their favour. Then they no longer applauded. Some even put a spoke in the wheel. If you foresee this, you must be able to get out of that contact beforehand – and that is not easy. (Andrey, Motorika, IC-high).

This quotation illustrates a rather paradoxical but typical situation for Russia. Russia as a whole and its national innovation system in particular are frequently accused by the national media and Western analysts and experts of the inefficient use of public funds. A significant amount of money was used to fuel the development of the Russian innovation sphere, but the results are not yet visible. In Russia, systemic problems are commonly attributed to a lack of competence among those who manage the relevant systems. Consequently, state officials are accused of either unprofessionalism (i.e., giving money to unqualified people or organisations) or corruption (i.e., the lack of results confirms that the money was squandered). Therefore, individuals responsible for state innovation or entrepreneurial-development programmes find it necessary to point out in public that successful start-ups have achieved something, saying "it was able to succeed as a result of our efforts and support". However, there are not enough start-ups in Russia that have produced notable results. Moreover, these start-ups usually participate in several state support programmes simultaneously. Therefore, there is competition among those who want to publicly use a successful start-up as evidence of the efficiency of their support programmes. When they are unable to do so, they take it as a personal affront. Thereafter,

they either refuse to cooperate or even make negative decisions on behalf of their organisations, thereby removing the start-up's access to the necessary resources.

This discussion of the differences in the network-management approaches of entrepreneurs from different innovativeness categories indicates that these approaches evolve throughout the life of a company. To address this issue, the next section of this dissertation is devoted to the nature of this evolution, and the extent to which external factors change the relations between entrepreneurs and the people within their networks.

3.2.4. RQ2: In terms of an entrepreneurial venture's development, how does the network of relationships evolve over time?

When answering questions about the evolution of their networks, entrepreneurs considered not only the evolution of relationships with suppliers and partners, but also modifications of relations with customers.

Evolution of contacts with suppliers and partners

Respondents in all categories pointed out that the evolution of contacts with suppliers and partners was mainly determined by the tasks that the company had to solve in certain stages of its development.

> Evolution is always associated with a certain movement – in our case, with the development of the company. Every contact and every partnership is, in principle, necessary for the realisation of certain tasks. Until the task is completed, the contact will continue. If the implementation of certain tasks requires the involvement of additional specialists in a certain area, new sources will be sought out and new contacts will be attracted. (Daniel, Football Platform, IC-medium)

The respondents indicated that the strategy and tactics for building a network of business contacts depended on the stage of the company's life cycle. Respondents whose companies were in the initial stages of the life cycle described their current networking behaviours. In contrast, representatives of companies that were in the late stages of development, such as market penetration, sales growth, or scaling and diffusion, talked about their companies' current strategies and retrospectively described the steps they took to create the network in the different periods of business formation.

> Depending on the goals that arose at different stages of our start-up's development, certain spheres of communication became meaningful. At each moment in time, we were surrounded by a different group of contacts. For example, when we started and we basically had engineering tasks, our main contacts were in the engineering sector. Then we had to work with orthopaedics and traumatology, as we were dealing with questions that defined the requirements for our product. In that stage, we talked a lot with doctors in the relevant specialties. When we thought about attracting investments (we had to find RUB 45 million), our group of contacts changed again, such that it was filled with private investors and business angels. I personally made forty investor pitches to these people. Someone else made

> another forty. Then we worked on the development of sales channels and new contacts appeared. (Andrey, Motorika, IC-high)

In summary, in the initial period of development, the entrepreneur's main efforts are focused on attracting the external resources and competencies necessary to create the foundation for the business. A high-tech company, for example, focuses on the development of technologies and related products. For a company operating in the hotel industry, an actual hotel forms the basis for doing business.

> For us, the main reason we now need to attract contacts is to make a product. (Dmintry, Mereya Cosmetics, IC-high).

> In the hotel-construction stage, we mainly communicated with contractors. When it was necessary to prepare documents, we worked more with lawyers. When everything was already built, then our main communication was with travel agencies, which were a sales channel for us. (Daniel, Relax, IC-very low)

When a company is just being formed and it does not have a broad client base, the main efforts should be aimed at creating a positive image. In this regard, the entrepreneur needs to be active in establishing relations. His active deeds are viewed by his contacts as an approximation of how that entrepreneur will behave when developing the business. In this regard, the trust of participants in the professional community in what is really a non-existent company is based on perceptions of the entrepreneur's behaviour. If the entrepreneur is active and can convince others of his or her ideas, then cooperation and a certain level of trust can be established.

> Let us say, that you are in the initial stages, you have just started your business, you understand that the idea is thought out, complete in a logical sense and can allow you to reach some part of the market. However, the product is not actually there. Then you need to take a very active role. An entrepreneur needs to try to actively find contacts, communicate with people and find someone with whom to cooperate. You can call someone and say 'Hello! I want to talk with you. ... I have a great idea and an interesting solution that you need. We must arrange to meet'. At this stage, the new entrepreneur should not hesitate to go anywhere, to communicate with the maximum number of people and to offer them his idea. (Evgeniy, Giftery, IC-high)

As the business grows and new developmental horizons appear, it becomes necessary to establish new contacts with people capable of advancing the business. At the same time, some contacts begin to decrease in importance.

> When a project enters a new level, such that the volume of sales of goods and services in different categories begins to increase, the network of contacts must be optimised. For example, it makes sense to switch from working with a wholesaler on specific commodity groups to direct relations with manufacturing companies. From this point of view, the more successful the project is, the faster the network grows. (Andrey, Avto-Okey, IC-low)

> Some contacts and business connections fall away because they are not necessary, but new, more interesting ones will appear. (Olga, Language Profi, IC-low)

When a product has entered the market and is in demand by customers, even though the production volume and number of customers are still low, more standard tools may begin to be introduced. These tools may include participation in exhibitions aimed at finding partners useful for expanding manufacturing and ensuring sales growth.

> If the product is ready and there are resources that can be spent on appropriate marketing activities, then you can attend a professional trade show, set up a stand and say, 'We are doing well. This is our product. We are waiting for you. Come to us and we will show you how well we can solve your problems with our product. (Evgeniy, Giftery, IC-high)

> We continue to build our business contacts through a presence at all major Russian exhibitions and professional fairs. We are also thinking about developing our dealer network in Russia. We will need to choose a suitable partner in each major city with whom we can share our experience with regards to the technology. If we can teach our partners to service our equipment locally throughout Russia, then we can trust them to provide relevant services to our clients and, subsequently, carry out sales, thereby becoming our dealer. (Andrey, Agropromholod, IC-medium)

As the company develops, new goals and objectives emerge, and the circle of necessary contacts as well as the tactics for attracting them change. The respondents' answers show that the network of contacts evolved in different ways for companies in different innovative categories. For example, for less innovative start-ups, the network of contacts stabilised at some point, while it constantly expanded among highly innovative companies.

> At the beginning of our journey, contacts with partners were constantly expanding. At that point, we purposefully studied different companies for possible cooperative purposes. Over time, however, the network of contacts decreased in size and then remained stable. On the other hand, work with certain contacts has deepened. Therefore, the number of contacts as a whole has declined, but our contacts are of better quality. (Pavel, Dial-Electro, IC-low)

The complexity associated with transforming an idea into goods or services largely depends on the degree of business innovation. For low-tech, non-innovative start-ups, it might be enough to obtain competent advice and start-up capital in the initial stages, and then to establish relations with suppliers and partners in order to prepare the product or service for the market. Highly innovative businesses need to solve many more tasks due to the uncertainty associated with the technology itself, as well as the need to find customers and satisfy their requests. Innovative companies often cannot function without support throughout their development, especially in terms of financial and material resources (e.g., production equipment). From this point of view, certain contacts can play a decisive role. Particularly important is the role of the strategic partner in the development stage, which is associated with the transition from laboratory samples to pilot production and then to industrial production.

> Our ideas have been confirmed in the university laboratory. Now I am looking for a strategic partner to create a prototype using its own technical and material resources. We cannot do that at the university. The presence of such a strategic partner is critical for the success of our project. (Evgeniy, ElStato, IC-high)

In general, innovative companies have to solve a wider range of tasks than non-innovative companies, as shown in Table 3.16. Therefore, innovative companies must establish a wide range of contacts. Moreover, although some of the contacts fade as tasks are resolved, individual contacts do not necessarily disappear. Instead, they can go into hibernation and be reactivated as needed.

> It is important to constantly expand the network. We must constantly look for new customers and new partners. Communications must continually evolve, which can only be positive for business growth. (Andrey, MasterSlavl, IC-high)

> If there are mutual benefits from communications, the expectations of the parties are respected, the stated provisions are fulfilled by both parties and the results satisfy both sides, then the relationship naturally develops. If there is no mutual interest, or it disappears because the problem is solved or the interests change, then the contact usually comes to an end. In my experience, I would say that 3 percent of contacts are evolving, 80 percent simply come to an end and the rest 'fall asleep'. They do not disappear – they can become relevant again if a solution to a similar problem is required. (Andrey, Motorika, IC-high)

Evolution of contacts with customers

The responses showed that the dynamics of the number of contacts with customers are directly related to total market volume, the consumption model in the market and the company's production capacity. Consumption patterns can range from frequent consumption (e.g., hair salons) to systematic consumption based on a previous positive experience (e.g., hotel services) to rare consumption associated with the satisfaction of a particular need (e.g., bathroom equipment or a pet feeder). For companies with limited production resources, the customer base grows until it reaches a volume that matches the company's production or service capacity.

> Initially, our client base was not very large, but it evolved quickly, with the number of clients growing significantly. At a certain point, there were a lot of them, and we realised that we simply could not cope and that quality was declining. The extra clients were eliminated, while important, loyal contacts were maintained. (Daniel, Relax, IC-very low)

> In fact, our network rapidly expanded in the initial stages. At some point, there were more customers than there are now because we were trying to sell everything to everyone. Over time, we chose those customers with whom we felt the relationship was comfortable, convenient and profitable. Thus, our client network narrowed. … Now, I believe that our customer portfolio is optimal. We know that they are all normal companies that stand firm and look forward to the future with us. (Andrey, Mirko, IC-very low)

In such companies, the role of the entrepreneur changes. In the initial stages of client-base growth, the entrepreneur is actively involved in the search for contacts with customers. Later, the entrepreneur takes on the role of monitoring interactions with customers, while the function of maintaining relations is taken over by employees.

> Of course, I have to communicate with clients now, but not as often as before. In our company, sales people and account managers are responsible for working on projects with our key clients and maintaining relations with them. My task is to create a workable structure, to keep it in working condition and to protect it. I must always look to the future

> and develop our already growing company so that we do not remain in one spot but always move forward. (Andrey, Agroporomholod, IC-medium)

In a business that is based on personal contacts with a client due to narrow or local customer market or because of the provision of customised services, an entrepreneur can remain being involved in interactions with clients.

> I maintain contacts with our clients. I try not to lose these people – I regularly write to them to find out how they are doing. (Mariam, Anin, IC-very low)

> It is very important to maintain relationships with the clients. This includes establishing permanent contact, and engaging in personal communication and meetings. Sometimes you just have to call to ask how things are going. In any case, you need to keep in touch with everyone and maintain relationships because otherwise people forget about you. You should always be number one for them. When you give them some attention, they are pleased to remain your client. (Andrey, MasterSlavl, IC-high)

In areas in which a product is relatively standardised, there is a large market, consumption is systematic or rare, and the company has ample opportunities to produce it, an entrepreneur should be interested in the constant expansion of the client base.

> If you were to develop another issue of the magazine, then you could print one, three, seven or even twenty-five thousand copies. The larger the print run, the more profit we make. We are like chicks with open mouths – we want an increasing number of contacts so that we can service them. Therefore, the simple quantitative expansion of the client base is the key to our success. (Alena, Orthodox Pilgrim, IC-low)

In such situations, entrepreneurs' efforts to attract customers are mainly focused on finding and building effective channels of communication. In such cases, the overall strategy for the development of the client base is constant, but the tactics evolve depending on the emergence of new, effective channels.

> In our case, word-of-mouth was working, as the girls told their girlfriends about new discoveries in terms of fashion and clothing. Basically, our client base expanded because someone saw our things and asked about them. Initially, we were spinning this way. Then, when social networks became an integral part of our customers' lives, we began to grow through social networks. Likes and reposts are the same as recommendations, and they also played a role in attracting new customers. (Olga, Branding, IC-very low)

In addition, the customer network can evolve due to a shift in the entrepreneur's interest in a particular market.

> When you have too many contacts, you begin to lose contacts periodically. ... With some, you start communicating less, while you start communicating more with others. ... Your focus shifts. ... When we initially entered the automated marketing market, my main communications were with people from the digital sphere, advertising, marketing and PR. ... When we moved to the production business, my network began to consist of people from big business – bankers, logisticians, production workers and consultants. Marketers are no longer in my active circle. I can address them, but we do not grab a drink like we used to. (Arthur, Directual, IC-very low)

Evolution of relations between people in the course of business development

The literature notes that an entrepreneur's relationships tend to start off as relatively formal and then evolve into friendlier versions. Respondents provided examples demonstrating that a multidirectional evolution of relations is possible during a business project.

Examples 1 and 2: the transition of professional contacts into friendly relationships

> My key business contacts are found in the network of distributors who are my customers. These are the main people for my company. I communicate with them and conduct business meetings with them. With some, I even become friends. (Vyacheslav, L'azur IC-very low)

> Professional contacts tend to turn into personally coloured stories. I have a lot of informal contacts as a result of the development of the start-up. In order for you to become friendlier with a person, it is necessary for your values to coincide. I even made a few really close friends during the development of my start-up. I did not aspire to do so – it happened naturally. (Arthur, Directual, IC-high)

Example 3: the transition of personal customer contacts into more official relationships

> Relations with customers have evolved over time. At first, they were more personal but now they are more formalised. If there are any problems, customers are expected to note them in our Support System. They also continue writing to my personal mail, as this was how we communicated when the business was young, but I am slowly transferring them to the official channels. (Maxim, Softvelum, IC-medium)

Example 4: professional non-evolving relationships with partners

> Professional contacts are not the same as client contacts, which need to be strengthened through periodic calls or holiday greetings. Professional ties are of a different sort. I just have these contacts in my phone. If I need to, I pull them out. If it is not necessary, I do not pull them out. In fact, these contacts do the same – they call me when they need to. (Mikhail, Unicorn, IC-medium)

Example 5: separation of the professional and personal in business relationships

> In my business, there were people who prevented it from developing. This was because, at a certain stage of development, I had specific tasks and I solved them with the help of certain people. Then I realised that I had outgrown these tasks but, at the same time, I had a certain responsibility to these people because they helped me to do something. I tried to live with it and seek some compromise. I think it is wrong to mix personal attitudes with business – you should view business as business and you should not invest personal emotions in that area. You can be friends with a person, but you must realise that doing so can hinder or harm your business. You should somehow separate the personal from the professional. You can continue to be nice to a person, but you should stop doing any business with that person if necessary. (David, Marmo Bagno, IC-medium)

The responses show that in order for a relationship to grow into a friendly one, a sense of mutual development, a sincere desire for mutual assistance in solving each other's problems, shared values and a high degree of trust are necessary. From this point of view, the analysis indicates that the emergence of personal friendships with customers is more typical among start-ups belonging to two innovative categories: IC-very low and IC-high. In the IC-very low category, the market is local and business is basically built on developing individualised solutions to customer problems. In the IC-high category,

companies try to understand the customer's needs and how the company's offering can address those needs. This is particularly true for those companies that are still in the early stages of customer discovery and customer validation. With the expansion of the client base, the approach to building relationships with clients can evolve. For example, a shift towards more formalised relationships can take place as shown in Example 3 or as described in the following quotation.

> We are still friends with many of our initial customers. Today, I do not even know who stays at our hotel. This represents an evolution of our relationships with customers. We were very involved with our first guests. We met them. We hosted them ourselves. We even accompanied them to their rooms. We asked what they liked and what they did not. Now we have transferred these tasks to our employees and they are handling them. As such, we are unlikely to make friends with new guests or get to know them. (Vladimir, Crystal, IC-very low)

Therefore, while building a business, friendlier relationships are formed with the initial clients due to the entrepreneur's high degree of involvement in communicating with them. Direct contacts with customers help the entrepreneur solve tasks, understand the potential of his product/service to satisfy the client's needs and develop a relevant business model. Later, when these tasks have been addressed, this sphere of contact becomes less relevant, which leads the entrepreneur to leave this type of relationship.

Interestingly, the analysis shows that respondents perceived closer friendships as a way to achieve a higher level of trust in business relations. This, in turn, had the potential to increase the level of loyalty in those relations.

> It happens, that acquaintance in business flows into friendship, which clearly increases confidence in the relationship. When first we get acquainted with a person, he distances himself a little at the first meeting. He is not always comfortable talking about some topics. Later, when you know a person better, more common topics for communication emerge. You can discuss something that is truly important to him. Therefore, trust increases. As a result, you can always interact deeper and get better results. (Evgeniy, Giftery, IC-high)

> We try to deepen relations with our customers, and to make them more personal and friendly. This allows us to expand our network of business relationships with customers. A strong relationship is the foundation of a good reputation, which helps expand our client network. (Elena, Transport Alliance, IC-very low)

For innovative entrepreneurs, for whom business development is the meaning of life, building friendly relations with partners is perceived as an almost indispensable condition.

> In general, relationships that start as purely business tend to become humanised over time and move into the sphere of personal contacts. This is still somewhat difficult for me. I am too cold – I should be able to build friendly relations with people. I think doing so is useful in terms of enabling the business to be successful and in terms of me better understanding myself within this business. (Sergei, SunProtein, IC-high)

> If we talk about how contacts evolve throughout the course of business development, the most important thing is that there should be a transition from dry, professional communication with people to personal relationships. For us, this often led to the building of

> friendly relations, which allowed us to be more successful as a business. (Andrey, MasterSlavl, IC-high)

Entrepreneurs representing companies in a low innovativeness category were accustomed to building relationships on the basis of formal contractual relations. Notably, they sometimes perceived the emergence of friendly relations in business as a threat. They argued that overly warm personal relations could be used by the other party to harm the business.

> Personal relations sometimes interfere with a sober assessment of the prospects for business development. With the establishment of personal ties in business, one must be cautious. I believe that business is business and that you need to calculate everything. If the calculation shows efficiency, then you have to take that step. A personal element in relationships is harmful for business. At least, my partners have always used friendly links to establish conditions that were less profitable for me. (Pavel, Dial-Electro, IC-low)

Interestingly, respondents over the age of 40 who were not engaged in an innovative business and who had no experience with innovative projects demonstrated an extremely cautious attitude towards developing friendly relations with partners. They said that they saw such relations as a threat. People in this category often used phrases along the lines of "trust, but check". At the same time, younger people whose attitudes toward life were formed after the year 2000 and people who had "been infected" with ideas of innovation (regardless of age) exhibited a higher degree of openness towards building close relationships with partners and more readiness to build friendly relationships. Moreover, some young entrepreneurs discussed the revelation that a friendlier relationship can create opportunities.

> For some reason, I initially thought that the most important thing in building business ties was to not cross the line of professional communication. That is, everyone should observe the subordination in business relations and communicate in a professionally cold manner. However, through my experience, I have understood that personal relations should also be present. In other words, it is not necessary to communicate always as a business person. Sometimes, these formalities can be avoided and you and your business partner can communicate as friends." (Loft, Robert, IC-very low)

Therefore, the analysis of the interviews collected in this study does not support the hypothesis found in the literature that entrepreneurs' ties with network participants always evolve into friendlier relations. The ability to transform formal business relations into friendlier relationships depends on the business context, on the entrepreneur's understanding of the value or risks of such relations, and on the entrepreneur's skills and psychological preparedness to engage in sincere and warm relationships based on trust.

This discussion of the differences in the network-management approaches of entrepreneurs from different innovativeness categories indicates that these approaches evolve throughout the life of a company. To address this issue, the next section of this dissertation is devoted

to the nature of this evolution, and the extent to which external factors change the relations between entrepreneurs and the people within their networks.

Respondents in different innovativeness categories noted that they were deliberately working to deepen relations, as deeper relationships served as the basis of a good reputation. A good reputation, in turn, could help attract the contacts necessary for business development. At the same time, some respondents in the IC-high category pointed out that in order for business contacts to arise and develop, trust between the partners was necessary.

3.2.5. RQ3: What role does trust play in building a business relationship?

The extant literature proposes that trust is an important factor in the ability and willingness of entrepreneurs to build and manage their networks. Therefore, two questions were included in the interview guide:

- What role does trust play in building a business relationship?
- How does trust between business participants change over time?

If entrepreneurs in different innovativeness categories develop their networks in different ways, as suggested by the analysis above, then they are likely to have different understandings of trust and the various mechanisms by which they can use trust as a tool for building a network. The results of this study testify to the accuracy of this assumption. The analysis of respondents' answers regarding the role of trust in building relationships and the evolution of trust in the development of those relationships are presented in Table 3.20.

Table 3.20. The role and mechanisms of trust in building a network of business contacts

Innovativeness category	IC-very low	IC-low	IC-medium	IC-high
Willingness to take the risk of working on trust	Medium	Low	High	Extremely high
Basis of trust	Experience of conducting similar activities, business practice	Aligned, time-tested relationships and partnerships between organisations along the entire vertical of value creation	Professionalism of the partnering companies and the people working in them	People engaged in the relationship; priority given to building personal relations
Role of trust	▪ A basic value and a tool for building relationships with customers, suppliers and partners ▪ Foundation for the simpler resolution of	▪ Organic part of long-term relationships – without trust, there is no relationship ▪ Perceived as a rational category, subject to continuous re-	▪ Measure of perceived risk in building relationships; the lower the trust, the higher the risk of interacting with a partner	▪ A relationship's intrinsic binding substance through which energy is transferred from one partner to another

	problems in the context of a large number of informal arrangements	evaluation based on feedback and experience with cooperation		
Trust in relationships at the personal level	▪ You cannot trust those you do not know ▪ Recommendation ▪ Quick establishment of a close and overly trusting relationship is risky ▪ The emergence of trust must have a strong basis, such as recommendations ▪ Development of trust is based on positive experience of cooperation	▪ Informal relations are less important than formalised relations ▪ Reliability is key to trust; includes the ability to always take the interests of the other party into account in interactions and compliance with agreements	▪ Professionalism ▪ Fame and reputation in the professional community ▪ History of personal and professional achievements ▪ Positive experience of cooperation in terms of results and ease of communication	▪ Coincidence of values ▪ Mutual gravitation in interactions and emerging rapport ▪ Strong personal business reputation ▪ Recommendations from trusted people ▪ Rank and position in an organisational hierarchy irrelevant for the emergence of trust; the individual's personality is important
Trust in relationships at the organisational level	▪ A priori lack of trust in the initial stages ▪ "Trust, but check" –relations with an organisation are only possible on the basis of reliable information about it that has been checked through friends and other sources ▪ All statements should be backed up through documentation	▪ Formalisation of relations and conclusion of contracts serve as the basis of trust ▪ Honesty in the implementation of contractual agreements ▪ Reliability and dependability of compliance with obligations assumed to be the basis of trust and loyalty	▪ Reputation of a reliable partner ▪ Professionalism in conducting business ▪ Portfolio of contracts concluded with other organisations in the industry is indicative of the fact that it is a trustworthy organisation ▪ History of joint projects	▪ Reputation in the market; recommendations or previous positive experience ▪ Low level of trust in impersonal relationships with organisations ▪ Conclusion of a detailed contract to protect against claims of failing to fulfil a partner's expectations ▪ Acceptance of the fact that concluded contracts do not always work ▪ Engaging in personal relationships to increase manageability and effectiveness of concluded contracts
Key principles in building relationships	▪ The rational component in assessing mutual benefits in the exchange of resources ▪ Verification by people with whom trust already exists ▪ Business relations must be supported by documentation	▪ A rational approach to building relationships ▪ Decisions about establishing partnerships based on the calculation and evaluation of benefits ▪ Trust is a consequence of compliance with	▪ Mutually beneficial cooperation ▪ Verification through known channels to reduce risk ▪ Clear agreements sometimes not completely formalised ▪ Honest cooperation with	▪ Readiness to trust even if relations are not formalised ▪ Willingness to provide a priory trust in building relationships ▪ Observing the balance between how much you are trusted and how much you trust

		agreements, which are usually formalised	a view to building a long-term, trusting relationship	
Expectations from partners	▪ Compliance with commitments regarding timing and financial aspects ▪ Respect the interests of the other party ▪ Compliance with verbal promises	▪ Legal settlement of relations ▪ Absence of deceit ▪ Honesty, openness ▪ Sincerity ▪ Symmetry and equivalence of benefits in relationships ▪ Taking the interests of the partner into account in interactions	▪ Professional, mutually enriching cooperation ▪ Symmetrical, honest and open attitude to work ▪ Respectful attitude ▪ Work within the framework of agreements ▪ Some readiness to go beyond formal relations	▪ Involvement and synergy in relationships ▪ Mutual consideration of partners' interests ▪ Honesty ▪ Openness and the absence of hidden intent ▪ Compliance with obligations ▪ Compliance with oral agreements ▪ Completion of work
Evolution of trust	▪ Initially cautious attitude ▪ Trust grows over time ▪ Trust easily lost if promises and commitments are not met	▪ Rational selection of a partner ▪ Relations either become reliable and trustworthy or cease due to a loss of trust ▪ Strive to build long-term, trustful relationships	▪ Initially prefer to check, but ready to take risks given perceived value of relations ▪ Development of trustful relationships based on positive experiences with interaction ▪ Some tolerance of the complexities of interactions provided that the partner has a desire to solve problems	▪ Initial sympathy for a person and a priory trust ▪ Relations built on the "person-to-person" level ▪ Readiness to build friendly business relations ▪ Trust gradually grows due to emergence of business achievements ▪ If the partner does not act in accordance with the trust given to him, the relationship is interrupted

Source: Developed by the author

When answering the interview questions, respondents in all categories pointed out that trust played a key role in building a network and establishing business relationships. Some respondents noted that trust was important in terms of both the external network of contacts (e.g., clients, partners) and the internal network (e.g., employees, co-founders).

> I think that trust plays a paramount role. For us, this is a basic value in relations between us and suppliers, and between us and customers. (Vladislav, Bouquet, IC-very low)

> Trust – it should be in everything. ... If you have business partners, then you must be sure that the relationships are honest. Employees must be trusted because otherwise you will have to do everything yourself. Moreover, it is impossible to lead 50 clients simultaneously – physically, it is impossible. In interactions with co-founders, everything in principle is built on trust. (Vladimir, Second Breath, IC-low)

> Trust is very important. To be trusted, you must inspire trust. It is not enough to say, 'We have installed our equipment everywhere. We already have a reputation in the industry and, therefore, you must work with us'. If partners or customers feel that you are not professional in some way, they will never cooperate with you or order high-tech equipment from you. (Andrey, Agroporomholod, IC-medium)

> Trust is truly important – it is the basis of all relationships. If it does not exist, everything rests on unsteady sand. (Andrey, Motorika, IC-high)

> In principle, I do not communicate with people whom I do not trust. At the heart of trust, in my opinion, lie common values. When I think about whether I should communicate with a person, I just look at his value system. If it turns out that he has a value system focused on the thought that 'I'll earn money quickly and that is it', then for me it is not a normal business. That will not be the one that interests me. (Arthur, Directual, IC-High).

These quotes show that trust is perceived as a fundamental value by non-innovative (IC-very low) and highly innovative (IC-high) companies. These companies believe that it is impossible to conduct or and interact with members of their networks without trust. Although this attitude toward trust reflects the uncertainty associated with the specifics of doing business, the reasons are different for the two categories. For example, in the IC-very low category, this uncertainty is likely to be explained by the small scale of the business, where most issues are dealt with in an informal way for the sake of simplicity. IC-very low companies need to be sure that they will not be deceived and that any problems that might suddenly arise with the partner can be resolved during negotiations. In the IC-high category, the uncertainty is primarily due to the high degree of complexity of the company's tasks. Sometimes these tasks cannot be formalised in terms of clear expectations for the partner's contribution or likely costs cannot be accurately assessed in order to conclude a contract. In such situations, there is no fair assessment because the innovative activity is new.

> Trust is very important because it is often necessary to negotiate without signing contracts. Accordingly, it is important to understand that you can trust people and become already involved in a particular project, even in the absence of a contract on paper, and to know that you will not be deceived. (Tatiana, Baylo, IC-very low)

> The presence of trust greatly facilitates the work. If there are minor problems and you have established trust with this client or supplier, you can peacefully resolve them in a simple way without resorting to lawsuits. You can just calmly discuss the difficulty. If there is no trust, then such things must be resolved in the courts. (Daniel, Relax, IC-very low)

> Innovative projects and processes require diverse, multidirectional efforts. We need people who are able to almost instantly integrate into the project and its energy, and diversified tasks needed to be attacked from different angles. Some sparkling energy at a metaphysical level should emerge between people if they are to become engaged in something innovative and unpredictable. Nobody even knows if the people's efforts will bear fruit in a material way – it could be that nothing will result. Trust is a prerequisite for people to exist together in an innovative project. If there is trust, then all is ok – the relationship will work and, most likely, it will bear results. (Dmitry, Mereya Cosmetics, IC-high)

For companies in the IC-low and IC-medium segments, trust is a mechanism that is necessary for ensuring the effectiveness of key business processes. At the same time, of all of the innovativeness categories, the IC-low segment demonstrated the most rational and prudent approach to all issues, including questions of what constitutes the basis of trust.

> You cannot be too trustworthy – you need natural caution. Common sense should be applied in everything. You need to reason and weigh each aspect sensibly when entering into relationships. (Andrey, Avto-Okey, IC-low)

> Trust always plays a role in establishing contacts and building business relations. However, you cannot just trust anyone and anything. Neither intuition nor emotions work. I would say that you must base all of your decisions on calculations. Compile a business plan, estimate all of the parameters, enter into a relevant contractual agreement and then perform. (Pavel, Dial-Electro, IC-low)

As technology companies often enter zones of uncertainty and undertake projects that are not always amenable to clear planning, they are more willing to enter into new relationships based on trust even though they know that they are taking certain risks.

> Trust is a risk that you take on yourself. To manage this risk, you should naturally try to assess how much you can trust the partner. Of course, there is some legal protection if you sign an agreement. However, sometimes it is easier to forget a relatively insignificant contract – if the customer did not pay you, for example – than to waste energy and money on forcing the issue. We would lose precious time by doing so, which could be used to develop our technology. (David, Marmo Bagno, IC-medium)

Respondents in all categories noted the importance of recommendations and information sources, which allowed for assessments of the possibility of establishing a trusting relationship. At the same time, the more highly technological a company was, the more often the respondents pointed out that it was difficult to find the necessary recommendations given the novelty of the projects. In general, innovative companies demonstrated a higher degree of openness to building trust relationships with new partners.

> In the construction industry, trustworthiness of business partners is a very important factor. We depend on our partners, as their work determines our ability to meet our obligations to the client in terms of time, budget and quality. This is an important issue. We look for partners through proven people and people we can trust. In our case, these are relatives, friends, employees, and colleagues with whom we have worked for a long time and whose opinions we trust. (Kirill, Dialog Construction, IC-very low)

> To assess whether we can trust a partner, we use recommendations. (Pavel, Dial-Electro, IC-low)

> It is important to contact professionals with a good reputation. For this purpose, it is necessary to check information about partners in all possible ways. With the development of the Internet, social networks, sources of formal and informal information, and Internet chats, this is now easy to do. Before building relationships with a business partner, it is very important to know that doing so is worthwhile. (Daniel, Football Platform, IC-medium)

> On the one hand, it may not be necessary to blindly trust people. On the other hand, the business we are dealing with is new, so it is not always possible to find someone through recommendations. Therefore, being overly cautious is not an option – it might be worth taking a risk sometimes. (KS Engineering, Alexey, IC-medium)

> The most important thing is openness and trust in each other. Without these elements, it is impossible to work in an innovative business. (Artem, Global Center of Engineering Services, IC-high).

Respondents in all categories indicated that trust grows as relations develop between network participants. In particular, trust grows with the joint acquisition of experiences from interactions, especially experiences gained in difficult situations, solving of which required special effort from the company and its partners.

> In my opinion, overly close and trusting relations should not emerge immediately and quickly. Trust must initially be based on positive interactions. (Elena, Transport Alliance, IC-very low)

> We are trying to build a partnership with our clients. As they are our partners, they have a high level of trust in us and they are loyal because we, in principle, treat them the same way. We understand that we are going to continue working with our clients for a long time. Therefore, we try to build the most favourable relations – we always move towards each other. (Karen, Create Develop, IC-low)

> Over time, if the experience of working together is positive, the degree of trust is enhanced. We have our old partners who trust us so much that it is enough to make a call and ask them for a prepayment when, for example, we need money. They will send some money to help us out and they will get the goods when they need them. Vice versa, they can ask us for a product and we will give it to them – they can pay us afterwards, a few weeks later. However, we can trust only a few clients. They are the ones we have worked with for many years. (Yuri, Vezdehod, IC-medium)

> If we talk about relationships with new partners that are just coming into the project, some kind of sympathy may initially arise, but trust grows gradually and it needs to be won. You have to look at people and try to assess how much you can trust them. There must be a balance between how much you are trusted and how much you trust. I believe that the level of trust in a partner is as high, as the problem that got the two of you together was important and then you successfully solved it through joint efforts. (Andrey, MasterSlavl, IC-high)

Respondents in all categories noted that building trusting relationships takes time, which is hard to plan or anticipate. A trusting relationship is difficult to build, but trust is easy to lose, which can ruin the relationship. Respondents noted that the concept of trust in business includes such factors as fulfilment of obligations, reliability, a lack of deceit, honesty, openness, sincerity and symmetrical relations.

> Trust is not easy to deserve. However, it is easy to lose if, for example, some oversight occurs and you do not fulfil your obligations. It is important to understand this. (Daniel, Relax, IC-very low)

> In order to build a trusting relationship with partners and clients, you need to communicate sincerely. The main thing is not to deceive – to always be open and honest. You must always maintain the reputation of a reliable person in a relationship. (Olga, Language Profi, IC-low)

> In order to build trust, we try to work honestly and openly. In this case, our partner shows the same qualities. In order for people to treat each other with respect, they must work in a clearly defined, understandable framework. (Alexey, Robotechnics, IC-medium)

> If someone slipped, cheated or did not fulfil an obligation, even if it was in a minor deal, then that would form the general picture. That picture, in turn, would lead to the formation of a certain opinion and a corresponding attitude toward that person. Then no one would build a trusting relationship with that person. If you do not fulfil your obligations, then your partners will not fulfil their obligations to you. (Sergei, SunProtein, IC-high)

> Trust plays a key role in existing business relations. The main thing is not to lose it. In that regard, trust must be strengthened in some way. You should always correspond to the level of trust that you are given, and you cannot let down the people with whom you are building a business relationship. The result will be some kind of symmetry and even synergy in the relationship. (Andrey, MasterSlavl, IC-high)

The respondents pointed to deliberate fraudulent actions as the main reason for a loss of trust in a partner. They also highlighted dishonest, unsymmetrical attitudes and a failure to take the mutual interests of participants in the partnership into account.

> Although trust plays a huge role, people say "trust, but verify". In fact, our business is susceptible to fraudulent activities. There are unscrupulous companies that deceive and do not pay for the products they receive. Therefore, we must re-check every client repeatedly through our acquaintances and internal contacts before we ship our products. (Andrey, Mirko, IC-very low)

> If you have a business partner, then everything should be legally settled and that partner should have an honest attitude towards you. He or she should not put his or her interests above your interests. Your partner must take your interests into account and treat you fairly, equally and symmetrically. (Vladimir, Second Breath, IC-Low)

Interestingly, while non-technological companies viewed the emergence of mutual, material benefits as the main reason for building trusting relationships, innovative companies pointed to the possibilities for mutual enrichment of ideas and mutual development in the innovation space.

> To begin with, I strongly advise you to plan everything very carefully when you intend to build a trusting relationship. Consider in advance what you can give someone from whom you want something. (Anna, Sweatshirt, IC-very low)

> In general, I build all business relationships as friendly relationships. I believe that friendship reflects a higher level of trust – you trust a person unselfishly. There must be some kind of internal chemistry for this to occur. I try to surround myself with people with whom I feel comfortable and who, at the same time, are useful, so that we are interested in creating something new together. At the same time, I try to find people who are outstanding in their fields and who do certain things better than I can. As I am better in other ways, we exchange ideas and grow together. This is important. For me, in general, business and personal relations are all intertwined. That is what I want. (Dmitry, Mereya Cosmetics, IC-very low)

Non-innovative and low-innovative companies saw the formalisation of relations in contracts that detailed the obligations as an important factor in the development of trust. In contrast, highly innovative companies expressed the opinion that formal channels and contractual relations did not work unless contact was established with the right people at the right level. Respondents in highly innovative companies pointed out that business relationships had to be built on personal grounds in order to increase trust. In other words, contact with partners should be established at the person-to-person level rather than at the organisation-to-organisation level.

> You must trust people. However, in business relationships, I do not advise anyone to negotiate in words. All words must be backed up by signed agreements. (Vyacheslav, Lazur, IC-very low)

> Trust in business relations is a wonderful thing, but sign the contract right away and then talk about trust. In addition to oral agreements and promises, always sign a contract. This will make your trusting relationship even more solid. (Alena, Orthodox Pilgrim, IC-low)

> I almost immediately established a contact with a large pharmaceutical company. There were even meetings with its general director, who said that they would like to buy almost the entire volume of our product. This client wanted to become partners on exclusive terms throughout Russia. We even concluded a contract. After that, they came to our factory to carry out certification, so I believed that our cooperation had already begun. However, in the end, everything still only exists on paper – the contract is not being implemented. We did not manage to establish personal contacts with people from this company, so we did not know how to manage the situation. (Sergei, SunProtein, IC-high)

> We consciously try to transfer communications onto a personal plane. I always try to reach someone at the decision-making level in both state corporations and companies, and I establish personal contact and personal communication with that person. (Arthur, Directual, IC-high)

> We try to communicate with a concrete person in any organisation. In Skolkovo and in the Research Institute of Nutrition of the Russian Academy of Medical Sciences, there were specific people with whom we communicated. This often happened informally on the personal level – not within the framework of an official request that people officially answered. We sent letters, but afterwards we established personal contact. (Sergei, SunProtein, IC-high)

According to innovative entrepreneurs, purely formal relationships do not work in business. Personal contacts allow partners to bring relationships that have been created on paper to life.

> You can sign a contract. However, paperwork does not do business – people do. I invest my time in communication to increase my partner's loyalty. He will also make a return on my investment by saving me time, promoting my business and, thereby, actually make a profit. That is an important task – to build personal relationships. You can trust people but not organisations. It is difficult to conduct business when you do not communicate with the right person in a partner company. (Evgeniy, Giftery, IC-high)

> The personal component always has a favourable effect on business relations because it helps to increase the level of trust. Once you switch to personal relationships in terms of communication, then it is easier for people to communicate with you, you trust them more and you can do more together. (Andrey, Masterslavl, IC-high)

The discussion above leads to the conclusion that trust is an integral part of relationships within contact networks for all of the entrepreneurs who participated in the study. The highest degree of readiness to trust and openness to building friendly business relations was demonstrated by innovative companies. For entrepreneurs from this category, the rapport between participants in the relationship, which was based on common values and interests, was of particular importance. The common values and interests related not only to material elements but also to creating something new through joint efforts. The

respondents' answers also showed that building trust on the basis of personal relationships, including friendly ones, was of great importance for innovative entrepreneurs.

All respondents pointed out that trust should expand in the course of relationship development and the shared experience of doing business. At the same time, for the overwhelming majority of entrepreneurs, a loss of trust meant the cessation of both personal and business contact.

The analysis of the interview data revealed some variability in respondents' answers, which depended not only on the degree of business innovativeness but also on the respondents' entrepreneurial experience. In this connection, a question arises as to whether it is possible to single out the patterns of evolution in the approaches that entrepreneurs in different categories use to build networks as they gain experience.

3.2.6. RQ4: Does networking behaviour evolve as entrepreneurial experience increases?

The data analysis shows that as entrepreneurs gain experience, their networking strategies change. At the same time, there are some differences in how networking evolves among entrepreneurs belonging to different innovative categories, as reflected in Table 3.21.

Table 3.21. Evolution of networking behaviour among entrepreneurs as they gain entrepreneurial experience

Innovativeness categories			
IC-very low	**IC-low**	**IC-medium**	**IC-high**
▪ To start construction of the network, contacts are established based on the recommendations or referrals of family members, close relatives and friends. ▪ Knowledge of how to do business is typically obtained from personal communications with trusted contacts (close circle, reputable people from the industry). ▪ Network of contacts with suppliers and partners is developed, to some extent, through independent trial and error. ▪ In developing the network, the	▪ Initially, existing contacts are used to establish links, which are then supplemented independently. ▪ Contacts in the professional sphere are acquired in order to gain knowledge about the peculiarities of doing business and in order to find partners. ▪ As experience is gained, entrepreneurs learn to intuitively determine the potential of a contact in terms of its reliability. ▪ The gradual formation of the company's reputation helps when	▪ The existing contacts from the professional environment are the starting point for the establishment of the company. ▪ As the understanding of needs for improving the technology and product deepens, an understanding of necessary contacts arises. ▪ Specific, independent efforts are made to establish appropriate contacts. ▪ After the introduction of the product on the market, contacts are developed in a professional environment, often through exhibitions or professional	▪ Initially, a major role is played by participation in educational programmes, business forums and innovative projects, through which certain contacts are acquired. ▪ The mentor plays a key role in the development of the required contacts. ▪ Subsequently, understanding emerges in terms of what kinds of contacts are needed. These are mostly in the professional, innovative and venture spheres. ▪ The search for contacts is carried out in a planned and

experience of employees and the recommendations of clients are used. ▪ At some stage, an understanding of how to conduct business in the industry is formed. The formation of the backbone of the business network is completed, after which it slowly evolves as necessary.	approaching potential partners. ▪ As the business grows, the network of contacts stabilises, and fewer new contacts are needed. ▪ The knowledge acquired by entrepreneurs in the industry allows them to quickly attract new connections as needed for business expansion.	communities (including virtual communities). ▪ The circle of contacts gradually increases over time and is basically connected with the increase in the scale of business. ▪ The professional reputation of the company and the entrepreneur help not only to effectively find the necessary contacts but also to attract parties interested in cooperation.	purposeful way, as it is necessary to constantly build up a network of contacts in order to solve newly emerging tasks. ▪ There is a need to share experiences and ensure personal development, including network-governance skills. ▪ To simplify the attraction of contacts, the entrepreneur puts himself at the centre of communications, and serves as a speaker at professional, entrepreneurial and innovation conferences. ▪ The start-up not only participates in projects and events organised by others, but also creates development platforms for the industry and the innovation community.

Source: Developed by the author

The analysis of answers from respondents in all categories shows that the acquisition of experience allowed entrepreneurs to expand the range of contact sources and increased the number of useful ties. Such experience also enabled entrepreneurs to acquire communication and network-governance skills that changed their networking behaviours.

The more innovative the business and the wider the prospective market, the more extensive the network of contacts built by the entrepreneur. This, in turn, required a more planned approach. For example, entrepreneurs in the IC-very low category relied on their closest circles in their network building. In the initial stages, this circle included relatives and friends. As experience was gained, the circle expanded, but rarely did it go beyond the industry. As such, it remained sufficiently local. In addition, respondents in this category rarely had a conscious strategy for building networks. Instead, networks were built naturally through trial and error.

> I believe that my parents played a significant role in the development of my business. Without their participation, I could not have done it all. Through them, I obtained contacts with people who were engaged in similar businesses in this area. I gradually learned how to find the right connections with which I could consult, learn, and gather details on how they started and what was required. (Mariam, Anin, IC-very low)

> Our network developed very quickly in terms of activities and slowly in terms of results. In other words, a lot of mistakes were made. We engaged in a lot of poor relationships and failed to foresee a lot of pitfalls. At the very beginning, we could not boast that we formed our ties in the right way, but we learned. We already knew what one should not do – we just became like a fish in water in our sphere. Nowadays, many novice entrepreneurs ask us for advice about whom to contact, how to start, how to proceed and so on. (Kirill, Dialog Construction, IC-very low)

For some entrepreneurs in this category, contacts with employees and clients were particularly important. Such direct communications enabled entrepreneurs to master their understanding of the principles of doing business.

> I have gained a lot of knowledge on all issues from my employees. I always listen attentively to the professional opinions of my employees and my clients, who give me a lot of knowledge and insights from their own experiences. (Svetlana, ASK-Capital, IC-very low)

Respondents in the IC-low category indicated that, at the time of their companies' creation, they had certain connections that were useful for creating a business. In other words, even in the initial stages of business creation, novice entrepreneurs in this category had a wider circle of contacts than those in IC-very low category.

> The existing business contacts played an important role in the creation of our business. For example, we used the contacts available to one of our co-founders to agree on the Vianor franchise and organise a new sub-brand. Then, as tasks appeared that could not be solved through simple usage of the available ties, new contacts were found, sometimes through referrals or recommendations. (Andrey, Avto-Okey, IC-low)

In this category, business required more communication with partners, which led to more dynamic growth in the number of contacts and communication skills. Experience with establishing contacts improved, as entrepreneurs became more involved in communication with different partners. As experience grew, the entrepreneurs' confidence rose and a more accurate understanding of what could be expected from partners emerged.

> Do not get upset if a business relationship is not established. You can always be sure that there are other people with whom you can agree. In the beginning, I was always very disappointed when a potential partner refused to engage in cooperation. Then I realised that, in terms of building business relations, one must always be self-confident. Although I previously felt some embarrassment ... I thought that we were "number two" in negotiations, I began to understand that there are two equally important parties in business communications. In order to build a strong supportive network, you always need to be confident. (Karen, Create Develop, IC-low)

> As the company developed, I gained experience. I began to approach the search for contacts in a different way – based on intuition or something like that. I looked more at potential partners in terms of whether they could keep their promises and deliver results. (Vladimir, Second Breath, IC-low)

With the development of the business and the growth in entrepreneurs' professional competences, the sources used to acquire contacts changed. As each company's history and reputation grew, it became easier to find the right partners.

> As the business developed, we gradually collected professional knowledge and the necessary contacts. Therefore, I do not even participate in industry conferences on IT anymore. Over time, a reputation arises. Now, some contacts find us instead of us finding them. When we were a young company, we needed to actively go to the outside world. Now that the company has taken its place in the market and has established regular contacts with other market participants, it is easier to find partners. I now probably spend more time on PR than on searching for contacts. (Vladimir, Second Breath, IC-low)

Respondents in the IC-medium category also indicated that access to contacts before starting the business largely determined the basic conditions for the start of the project. At the same time, the initial contact base of some respondents in the IC-medium category was international from the beginning. For others, the development of a technological business subsequently required a move to the international level.

> Of course, our Italian strategic partner gave us a lot: technology, contacts, etc. At the same time, the Italians taught us important lessons: not everything that works in Italy is necessarily good for our market. We had to amend their technology, which required finding the right people in Russia as well. (Andrey, Agroporomholod, IC-medium)

> We needed manufacturers and equipment suppliers. For our business, they were all in Germany or in Italy. We had to look for their contact information, approach them and negotiate. (Yuiri, Vezdehod, IC-medium)

The respondents indicated that as the initial results of partnerships were received and professionalism was confirmed at the company and personal levels, new contacts could be attracted.

> We began to participate in exhibitions and trade fairs, including all key events in Moscow. We took part in foreign exhibitions with our Italian partners. We spent a lot of time on this. Clients and potential partners could see us and our equipment there, and they could see that we were a serious company with which it would be good to talk and negotiate. (Andrey, Agroporomholod, IC-medium)

> I am a member of Java User Group, a community of professional developers in the Java language, which is my main professional specialisation. I am present in the basic Java communities and I even write articles on the subject of Java. For example, I wrote several articles for habrahabr.ru. This makes it easier for me to find partners. They already know my level of competence and it is easier for us to communicate. Sometimes I do not even look for them – they approach me. (Maxim, Finansista, IC-medium)

Thus, through the acquisition of personal experience and the formation of the company's reputation as a successful player in the market, entrepreneurs tend to move toward a more active position. In the beginning, as an unknown novice that represents a new venture, the entrepreneur seeks out contacts. Later, the company's achievements and the entrepreneur's personal successes attract valuable contacts. This trend is even more evident in responses from respondents in the IC-high category.

Interestingly, 9 out of 10 respondents in the IC-high category already had entrepreneurial experience. Moreover, six respondents had been involved in innovative projects in the past

as co-founders, team members or mentors. Therefore, they responded retrospectively about their actions when building contacts in the initial stages of their entrepreneurial trajectories. All entrepreneurs in this category said that they initially did not have relatives or close friends in their personal circles who were engaged in business. On the contrary, the activities of participants in their close circles were typically related to either science or engineering. Therefore, people in their close circles could offer advice on the development of a technology rather than its commercialisation. Several respondents said that in order to acquire basic knowledge in the field of business, they participated in educational projects and activities in the field of entrepreneurship, including paid forums and short-term training for entrepreneurs (e.g., Synergy Global Forum, Business Forum Atlantes, Business Youth). These respondents pointed out that these events were valuable because they broadened their outlooks and motivated them to engage in entrepreneurship. However, they did not provide an opportunity to obtain contacts useful for establishing an innovative start-up. In this respect, professional exhibitions and innovative events were more useful.

> Strangely enough, my craving for business knowledge began with the fact that my girlfriend gave me a ticket to the Synergy Global Forum for my birthday. Today, I laugh because I now know that this is purely a marketing event at which the Synergy Business School sells its training without offering any deep knowledge. However, in terms of motivation ... what to learn, where to get information, what books to read – it was a good push. I did not actually obtain any significant contacts for my future business there. (Vladislav, Animo, IC-high)

> Four years ago, I went to the "Business Youth" events. I think they were useful in some sense and played a positive role to some extent. Generally, four to five years ago, there was an entrepreneurial boom. Everyone was hanging out at entrepreneurial events of all kinds. I think everyone tried Business Youth, Digital October activities and the like. Now I do not have time for that kind of thing. For me, it was a sort of initial information-gathering activity. Today, I already have an understanding of what we need. I do not want abstract discussions on the benefits of entrepreneurship. I need the more concrete knowledge that is necessary to solve the problems facing our project, which will have concrete benefits. I now go to professional exhibitions, and to innovation and status events, such as "Open Innovations Forum". At those events, you can find useful contacts: mentors, investors or team members. (Sergei, SunProtein, IC-high)

Respondents in the IC-high category pointed to the special role of mentors, who were experienced people with a clear picture of the entire trajectory of start-up development. They not only knew where to find the right contacts at the appropriate time, but they also had their own extensive networks, which were useful for project development. Moreover, the mentors added their energy to the project, which created an impetus for all team members to more actively engage in their work.

> The mentor's energy is important. He is expected to be able to immerse himself in the product and infect the team with the "viral idea" of the superiority of the product. The team then begins to infect everyone around it, talking about the fact that there is such a magical product everywhere they go. This will attract events and people, and involve them in the project. (Dmitry, Mereya Cosmetics, IC-high)

The respondents indicated that as they acquired entrepreneurial and innovative experience, their network-building behaviours changed. Some respondents noted that they then tried to not only to attend various events as participants but also as speakers. This allowed them to more effectively build relationships with the people needed for business development, as these activities meant that they were no longer requesters of help but valuable participants in the professional community – worthy partners with whom it would be prestigious to conduct business.

> My strategy for building a network of contacts has not seriously changed as I gained more experience. The fact that it is based on the goals and tasks that have to be solved at a certain stage of business development remains the same. However, my tactics have changed significantly. Initially, I approached contacts as if I were some sort of trainee: "You are so clever and such clever things were said. I did not understand anything – please tell me more about it". People love it when someone publicly recognises that they are clever, so they share their expertise, knowledge, experience and their own contacts. I have since changed my approach. I understand that at this stage it is no longer possible to contact people from the position of a trainee, either because of my age or because of the innovativeness and advancement of the product that I represent. Therefore, I am increasingly trying to participate in all events as a speaker. As such, I declare myself an expert in the field of innovation development. I present myself as a revolutionary who has something to offer others. Now interested contacts share information and connections with me because we mutually enrich each other. I not only receive something from them, but I also add value. (Arthur, Directual, IC-high)

In addition, with the acquisition of experience, entrepreneurs' expectations changed with regards to which contacts offered value and how they could benefit from those contacts.

> Previously, when I went to innovative events, I wanted to get contact information for a certain person, such as Igor Rybakov.[50] I thought that such a unique contact could suggest some really important ideas for my business's development, like a formula for success. However, I realised that such people are not really necessary. If your mentor is an experienced entrepreneur, that is enough. Igor Rybakov was just a public person and everyone had heard about him – there was a difference. Nevertheless, you can learn from lesser-known entrepreneurs who are successful. At the same time, your business project will be unique in some ways, so no universal formula for success, even if one existed, would be applicable to it. (Vladislav, Animo, IC-high)

Respondents pointed out that a start-up had to be actively positioned in the external environment in order to create some sort of friendly and conducive atmosphere around it.

> Public recognition is needed to promote the start-up as a brand in the future, but it is also key for investors and the entrepreneurial community. This is important when you need help. Say, for example, that you want permission to become a resident of Skolkovo technopark. Then five experts will evaluate you. For them to arrive at a positive assessment, they should know you well. If they have heard about you and your start-up, then there is a much greater chance of getting the support you need. The popularity of the start-up also leads to the fact that customers themselves start to write. In other words, the promotion of the brand helps in many other ways, not only it is needed to increase sales when the product is launched in the market. (Vladislav, Animo, IC-high)

[50] Russian entrepreneur who was included on Forbes' list of the richest people in Russia in 2017 with USD 900 million in capital. Rybakov is co-owner of the Technonikol corporation and co-founder of the Rybakov Foundation.

The recognition and reputation of innovative start-ups also allowed entrepreneurs to communicate with more highly qualified specialists who could provide more significant help.

> You should always try to get acquainted and communicate with those who are older than you – those who have something to offer. They can prompt an idea or lead you with good thoughts. We should strive to start cooperating with large firms. They have experience, money and everything else you might need. (Vladislav, Animo, IC-high)

Respondents noted that network-building skills and general behavioural tactics evolved as entrepreneurial experience increased.

> I learned how to communicate with more professional players in the business community at the same level. In the beginning, it was hard for me. I psychologically could not do it and I did not know how to do it more effectively. (Vladislav, Animo, IC-high)

> In order to learn how to properly build relationships with people, you need to communicate more often. At the same time, one must follow the reaction to one's own words and behaviours. For example, most people do not know how to listen and hear at all. You tell them directly, but they do not hear you. This does not necessarily depend on age – it is a basic ability to perceive information that comes with experience. I only realised this after I had made a lot of mistakes in the beginning. (Arthur, Directual, IC-high)

At the same time, young entrepreneurs in this category who had little experience indicated that they felt a need to improve their communication skills in order to establish mutually beneficial relationships with partners.

> In terms of contributing to personal development, we have, for example, a club of entrepreneurs at Moscow State University. This is an environment for communication, but it is still in its infancy. I hope it will develop soon, hopefully with my help, and that it will be useful for people. I feel that I need to be embedded in some sort of driving and inspiring media to grow myself, particularly with regards to gaining the experience required to build effective communications to achieve synergies when doing business with others. (Sergei, SunProtein, IC-high)

Experienced entrepreneurs in this category (i.e., those who had already completed several successful projects), eventually came to the understanding that in order to become visible, it was necessary to not only participate in events organised by others, but also to create a communication platform and initiate activities that united the maximum number of stakeholders (e.g., entrepreneurs, businessmen, clients, government, development institutions). The benefit for a start-up that serves as the organiser of such a platform is that it stands at its centre, where it is the focal point and where it can take advantage of important contacts. For an innovative start-up, this is particularly important, as the high degree of novelty associated with its product often requires the emergence and development of a new market and a new consumption model. This cannot be achieved without combining the efforts of as many industry players as possible. This active positioning of innovative start-ups, which had to create the networks needed to develop the

market and industry while also building the networks needed for the development of their own products, distinguished their networking behaviour from the behaviours of those in other innovativeness categories.

> We have established an educational centre, where we will train cosmetologists in using our product. They will come to us for training, for certificates and for information on new technologies. This is important because novelties are desired in beauty salons. Beauty salons have customers who want to try something new. By developing cosmetologists, we create a market for our product. (Dmitry, Mereya Cosmetics, IC-high)

> Given the peculiarities of our project related to childhood education, our main relationships at this stage are with governmental authorities at both the city level (i.e., Moscow) and the federal level. In order to develop these ties, we create new projects in which our contacts become important participants, and we allow them to hold various events here at our premises in MasterSlavl – conferences, round tables and consultations. An additional benefit for us is that, through these activities, we are expanding our links with the business community and we are driving it toward a better understanding of the educational principles that we implement here in MasterSlavl. We are organisers and sometimes even sponsors of such events. (Andrey, MasterSlavl, IC-high)

> We do not just communicate with all of the leaders in our professional community – we created our own union of prosthetic developers and suppliers of technical means of rehabilitation, known as CYBATHLETIC. Last year, the first all-Russian conference on high-tech prosthetics was held. That day, we managed to collect 90 percent of all Russian start-ups working in this area. Participants included all of our main competitors, including foreign ones, and all of the relevant Russian ministries – the Ministry of Labour, the Ministry of Trade, the Agency for Strategic Initiatives and the Social Insurance Fund. We organised roundtables in which the participants in this market exchanged views. Moreover, we attracted disabled people, including Paralympic champions and leading commentators from sports programs on TV. Everyone was forced to talk about it. We believe that our mission is to change the culture of prosthetics in Russia. Therefore, we are committed to realising everything that contributes to achieving this mission. For example, the first Cyborg World Championships was held in Zurich last October. Motorika went there as a part of the Russian team. Even if the national team did not take part, we would have registered ourselves and gone. Upon our return, we initiated this event in Russia. In June, we will hold the first Cyborg Championship in Moscow. In November, we will hold the first Russian championships for cyborgs. We have registered the CYBATHLETIC union, which aims to host the World Cup in 2021 and to create a sports federation for disabled people using prosthetic devices. (Andrey, Motorika, IC-high)

Therefore, the data analysis confirms the proposition that novice and experienced entrepreneurs engage in and build their networks in different ways.

3.3. Implications for state innovation policy

This study showed that innovative start-ups in the IC-high category both knew and used the opportunities provided to them by the Russian innovative system. They were able to rationally assess the pros and cons of interacting with NIS actors. In general, the assumptions made in the second chapter as a result of the analysis of the Russian NIS's development (i.e., regarding the benefits, opportunities, costs and risks associated with interactions in the system; see Table 2.23) were confirmed. When discussing their sphere

of contacts, start-ups in the IC-high category paid a significant amount of attention to describing their interactions with development institutions. They noted the opportunities that arise as a result of relationships with those institutions as well as the risks, which they perceived as so significant that some entrepreneurs worked to minimise contacts with development institutions, such as the Skolkovo Foundation and IIDF.

Thus, this study confirmed that a number of measures introduced to develop the Russian NIS were justified from the point of view of providing opportunities for start-ups. The respondents mentioned that participation in innovative forums and events organised by the ASI and RVC was generally useful in terms of meaningful support. In other words, such participation provided the necessary information and energy boost. The Innopraktika project was also noted as effective. For example, two companies – Mereya Cosmetics and SunProtein – emerged as a result of the work of the biotech accelerator that was organised by Innopraktika through Moscow State University. The biotech accelerator aimed at creating an opportunity for motivated young people with knowledge of both management and applied disciplines (e.g., biochemistry, computer technology, applied physics) to take part in a promising project that was offered by an industrial partner.

> Within Innopraktika's biotech accelerator, there were meetings and presentations by industrial partners. In other words, large companies talked about their goals, products and business problems, and suggested that the accelerator's participants work on them. I liked the proposed project and I joined it. (Sergei, SunProtein, IC-high)

> I gathered my whole project team by participating in Innopraktika's biotech accelerator. I presented the idea, said what we wanted and described the strategic partner, and then I invited young people who were interested to join the project. (Dmitry, Mereya Cosmetics, IC-high)

The created an innovation infrastructure, and the proposed measures of public and private support were used by active, innovative entrepreneurs.

> We received a grant from Innopraktika and we recently became a Skolkovo resident in order to obtain some support. Basically, these are tax breaks and grants. You can participate in exhibitions at the expense of Skolkovo – and not only in Russia. There are also tax benefits if we, for example, decide to buy production equipment. As a resident of Skolkovo, we can apply for a grant for R&D or for making a prototype. As we often conduct laboratory studies, being a resident may be advantageous for us, as Skolkovo has special premises equipped with all that we need. In addition, status as a Skolkovo resident increases the company's market value. It is a sign that we have gone through a serious selection process and, therefore, that we are trustworthy. (Sergei, SunProtein, IC-high)

> We are located in the co-working environment of the IIDF fund. I believe that it is fruitful for innovative entrepreneurs to locate themselves in an environment with similar types of people, such as a co-working environment or a technopark. This allows for cross-sowing. Every start-up makes mistakes. If entrepreneurs communicate and exchange information, they can provide advice along the lines of "Do not do it. I did it and it did not work". This saves a great deal of time and money. (Arthur, Directual, IC-high)

These forms of innovation-development support can and should be further developed, as they contribute to the emergence of successful innovative start-ups. At the same time, this study has revealed a need for additional organisational and conceptual development of existing forms of entrepreneurial support. For example, several respondents stated that they did not meaningfully use the opportunities provided by the development institutions, such as Skolkovo. In their opinion, although the possibility of becoming an innovative company and establishing links with development institutions could provide access to certain opportunities (e.g., becoming a technopark resident and receiving tax benefits), it would also impose additional obligations that would complicate the life of the start-up and drain scarce resources. For example, a start-up needs to compile a large number of documents to apply to a development programme. At the end of the period, it must submit multiple reports on the use of any support it received. In the respondents' opinions, a significant amount of time and effort must be spent on preparing bureaucratic documents on the use of state funds.

> To get into a technopark or accelerator, you need to spend four and a half months preparing a heap of unnecessary documentation that no one ever reads. Then you need to report on how the money was spent to prove that it was effectively used on for necessary items. Moreover, if this is a start-up, it is just learning how to do business – mistakes are inevitable. However, if you cannot explain your spending, then it is a nightmare. (Artem, Global Centre of Engineering Services, IC-high)

In addition, respondents noted that the interaction of entrepreneurs with funds entailed a number of difficulties and that it was not always easy to develop a mutual understanding. Several respondents stated that certain aspects of the funds' models for start-up acceleration, such as the introduction of fund representatives into management teams with the aim of influencing strategic and tactical decisions, threatened the success of business development.

> It seems to be better to distance ourselves from the IIDF. It is always dangerous when someone wedges themselves into your business and starts to manage it. This is more of a limiting factor than a supportive one. The team understands its product well. However, the external people say that what we are doing is not right. You can take their opinion into consideration once, but if it happens constantly, it becomes a hindrance. (Evgeniy, Giftery, IC-high)

Meanwhile, non-innovative start-ups and the vast majority of companies in the IC-medium category indicated that they did not use state support and did not participate in the development programmes. Therefore, the results of this study suggest that there is a room for improvement in this regard. A large number of entrepreneurial and innovation support programmes have been created at the state and private levels, and these programmes are actively looking for participants. As the study showed, most start-ups did not want to engage in these programmes. Therefore, it is advisable to continue studies with the aim to

provide an understanding of which methods of stimulating entrepreneurial and innovative activity are effective in the Russian context, and which create obstacles of a methodological, conceptual, administrative or psychological nature that do not allow support systems to work efficiently. The ultimate aim is to increase the number of start-ups and facilitate their growth, while not creating risks and high transaction costs for companies.

One point emerging from this study is that it is necessary to continue concentrating on supporting cluster-development programmes that can organically facilitate the building of relationships between start-ups and strategic partners. Such efforts should include those programmes involving interactions between companies and universities (e.g., the project proposed by Innopraktika) in which talented young people are encouraged to help businesses commercialise products and ideas. Such an approach may prove to be more effective than the one, which is still actively practiced now when universities are pushed to commercialise their scientific developments. The problem is that such commercialisation results may be unclaimed by existing businesses. But to build independent company capable to bring commercialisation results in the market, scientists do not have the appropriate competencies and resources. The analysis carried out in Chapter 2 showed that higher-education institutions have historically focused on fostering scientific potential in students. As such, they have been characterised by a certain tendency to reject business culture. Consequently, the declared concept of an entrepreneurial institution is still only partially realised and it has only been implemented in certain places. A national programme might be needed to popularise a practice-oriented entrepreneurial education within the framework of higher-education institutions, which, among other things, would include the creation of a community of university professors who were interested in sharing their best practices in the creation and teaching of courses that promote innovative entrepreneurship.

As large businesses with state participation are highly inertial, and unable to quickly and broadly create points of growth supportive of innovative or entrepreneurial activity, it may be worthwhile to pay attention to the experiences of such companies as Motorika, Mereya Cosmetics and MaterSlavl. In the future, these private companies will be able to stimulate the creation of small enterprises that will serve as their suppliers, distributors or partners in technological development. The value of these companies is that they not only possess the necessary expertise and desire to develop the market and the industry, but that they are also charged with highly positive energy, which bureaucratised, large, state-owned companies cannot impart to their own development programmes.

3.4. Conclusions

This chapter presented the results of the primary research, which entailed a qualitative survey of entrepreneurs from Moscow-based SMEs. The chapter is based on the results of the literature review (Chapter 1), which allowed for formulation of the theoretical foundation and the key questions for the primary research, and on the findings of the documentary analysis (Chapter 2) undertaken to uncover the specific features of the Russian innovation environment. The ultimate goal of this chapter within the frame of the current study was to build an understanding of the role of networking in solving the problems associated with commercialising ideas and technologies by Moscow-based SMEs established in the fourth and fifth phases of the Russian NIS's development. Moscow was the first region to be involved in the development of the Russian NIS. Thus, Moscow-based firms were the first to have an opportunity to create networks within innovative systems (both NIS and RIS) for the purposes of doing business and developing innovation.

The literature indicates that entrepreneurs' networking behaviours, especially in the context of transition economies, are poorly understood (see Chapter 1). This is particularly relevant in the case of Russia, as there are few modern studies on the subject of networking in this context (see Section 1.2.11). To highlight the importance of networking for innovation by identifying differences in networking behaviour, data were collected from firms with different degrees of innovativeness along the spectrum from low-innovation conventional companies to highly innovative companies engaged in the commercialisation of patented technological inventions. The research described in this chapter generated the empirical data that helped to confirm the proposition that innovative companies more actively use networking as a tool for the development of business and innovation.

The data analysis showed that entrepreneurs constructed their networks in different ways depending on the degree of business innovativeness. Less-innovative start-ups (i.e., those in the IC-very low and IC-low categories) took a more passive role in building network interactions. The data analysis provided evidence that low-innovation start-ups actively relied on formalised market and hierarchical mechanisms to build their relationships, while they were less ready than innovative start-ups to build relations based on trust. The former's circle of contacts was much narrower, they often established vertical connections and they rarely participated in horizontal networks. Usually, their network contacts were built organically, and they arose as a result of entering into relations with customers and partners, rather than as a result of purposeful and systematic actions aimed at opening up business opportunities or seeking new ideas or technologies for implementation. As such,

their networking strategy could be described as "establishing contacts as needed". Non-innovative and low-innovative companies viewed the formalisation of relations in contracts as an important factor in the development of trust. The more innovative a start-up was, the more actively it built relationships and widened its network of contacts not only to solve pressing problems but also to enable it to respond to opportunities for future development. These more innovative start-ups were also more willing to establish trusting relationships. That is, in their systems of business interactions, there were more network connections that supplemented established market and hierarchical relations.

The empirical data collected for this study suggest that market and hierarchical mechanisms for building relationships are widely used in Russian business. This finding is new – the extant literature, which mainly considers the situation in Russia through 2010 (see Section 1.2.11), argues that the mechanisms usually used to manage business relations in Russia are informal and based on social networking (i.e., *blat*-based and *svyazi* relations). The formalisation and professionalisation of business relations in Russia does not mean that people have ceased to interact on a personal level. Instead, although informal relations remain important, they complement formalised mechanisms rather than replace them. From this point of view, it can be said that the conditions and culture of doing business in Russia have evolved, become more civilised and moved closer to Western norms. Thus, the specific features of networking in Russian business, which were identified on the basis of the literature analysis (see Table 1.11), have already partially lost their relevance. However, in the high risk, unstructured business environment that still exists for innovative start-ups, companies prefer to establish personal connections, which are seen as more manageable. At the same time, personal, informal ties among NIS participants are not necessarily *blat*-based relationships, but more of an attempt to find synergies between organisations and to find people with similar mentalities and visions. However, in relations with state structures, personal connections are still perceived as an effective method of obtaining more accurate information or speeding up certain processes. Notably, none of the 59 respondents who participated in the survey used the term *blat* in describing business relationships. One interviewee who represented a company created in the first phase of the NIS's development did mention that business was easier to conduct in the early stages because *blat* and *svyazi* helped to solve various issues.

The results presented in this chapter showed that innovative companies' attitudes toward networking as well as their models for building and governing business networks differed significantly from the patterns seen in other categories. Empirical data provided evidences

that innovative companies that implemented radical innovations (IC-high) became integrators of the efforts of a large number of NIS participants in their network thus initiating team-type of interdependencies (see section 1.2.1). In essence, these actors were united by the start-up in a horizontal network in order to achieve certain goals, which were sometimes of a broader nature than the launch of the start-up's own product. In fact, innovative companies built several networks of business contacts related to the development of their own business as well as the development of the market and the industry. At the same time, synergetic relationships existed among these networks.

For less-innovative companies, networking was more of a means to achieve commercial business goals, while for a highly innovative companies, networking also served as a reason for engaging in innovative entrepreneurial activities. Given the high degree of novelty of products created by innovative start-ups and the lack of appropriate expertise in the entrepreneur's close circle of contacts, most of the ties were created from open sources. This required the entrepreneur to expend considerable effort on finding contacts and establishing good relationships. In this sense, the purposeful work of creating a network of contacts was perceived as an integral part of the commercialisation process, and distinguished the mechanisms these entrepreneurs used for creating and building a network of contacts from what could be observed among entrepreneurs in other categories.

The data collected within the framework of this study confirm the existence of cognitive gaps among the understandings of entrepreneurs, scientists, representatives of the venture community and development institutions of what constitutes an effective commercialisation process, and of the direction that purposeful actions should take. From this point of view, this study's findings confirm the conclusion of Andrushchak et al. (2018) that entrepreneurs (former engineers in their case) are more interested in the development of technology. As a rule, they already have a circle of scientific and technological contacts in which they feel comfortable and that supports them with regards to insights useful for the development of technologies. However, the creation of business and market networks (see Table 1.10) presents certain difficulties in terms of the existence of psychological barriers.

The models developed in this study, which are synthesised on the basis of a generalisation of the empirical data (e.g., the map of goals pursued by entrepreneurs in external relationships in Table 3.16; the overview of mechanisms of trust in building a network of business contacts in Table 3.20), should be of interest to current managers, who can use them as decision-support tools. In particular, the map is useful for building a more systemic understanding of best practices in the construction and governance of business

networks that should be applicable in each of the innovative categories. The discussion of differences in companies' understandings of the appropriateness of networking behaviour, including the mechanisms that give rise to trust in business, should allow managers to avoid common mistakes. Such mistakes often arise because managers fail to think about the possibility that their business partners might be in a different innovativeness category. Therefore, they build relationships without automatically taking the interests of the other party into account. As shown in the study, an inability to understand the interests of the other side often leads to problems in an otherwise trusting relationship. For example, a number of companies belonging to the IC-low category are likely to be suppliers for companies in the IC-very low category. At the same time, they are also likely to be distributors for companies in the IC-medium category. Therefore, an understanding of differences in the mechanisms for building and managing business relationships in all categories can help all value-chain participants be more effective. Often, former managers or entrepreneurs who had previously been involved in non-innovative businesses became innovative entrepreneurs. An understanding of the features of networking in an innovative environment should allow novice entrepreneurs to avoid the mistakes associated with subconscious attempts to transfer their experience into the new context of innovation development, which requires a different attitude and different networking behaviour.

The results derived in this study have a number of uses with regards to theory development and practical application. They also contribute to a better understanding of areas for further research with regard to networking and its relationship with innovation. The most important implications are summarised in the following chapter.

Chapter 4. Discussion and conclusions

The ultimate purpose of this chapter is to discuss the contributions of this study to knowledge and practice. The chapter also reflects on the limitations of this research and explains how future research on innovative networking might build upon this study.

4.1. Contributions to knowledge

This section aims to summarise this study findings in key research areas that were identified (see Table 3.1) and to highlight conclusions that address the gaps in the currernt scholarly understanding of networking and its role in innovation (see Table 1.12). The key theoretical contribution of this study emerged from the grouping of start-ups into innovativeness categories onto the continuum of "conventional business – knowledge- and technology-driven business", and from the identification of common patterns of networking behaviour in each category and differences among those patterns. The findings of this study are compared with key ideas found in the literature to identify the extent to which existing knowledge about entrepreneurial networking should be modified in the light of this study's conclusions.

The findings presented in this section are based on data collected through interviews with entrepreneurs representing Moscow-based firms. Therefore, the understanding presented here largely reflects the specifics of the national and regional contexts of Russia. However, as shown in the previous chapter, the behaviour of Russian entrepreneurs as a whole is similar to Western norms. Therefore, these conclusions may have a broader scope of use than to only provide a conceptual understanding of the networking behaviour of Russian entrepreneurs.

4.1.1. Role of networking in the founding and development of businesses

This study highlighted the differences in how entrepreneurs in traditional and innovative firms used networking to found and develop their businesses. The results of a comparison of this study's key findings with ideas from the literature are summarised in Table 4.1.

Table 4.1. Comparison of this study's and literature findings regarding the role of networking in the founding and development of businesses

Key ideas found in the literature	Findings from this study	
	Conventional businesses	**Innovative business**
▪ A start-up becomes a focal actor in the network	True	True
▪ Relations serve as a medium through which entrepreneurs gain access to a variety of resources	True In the main, material and financial resources are needed	True Material, financial and knowledge resources are equally necessary

▪ Contacts are viewed as a source of business information, advice, emotional support and problem solving	True	True
▪ Recommendations and referrals play an important role in establishing links	True, referrals usually come from close circle	True, referrals usually come from professional circle
▪ Entrepreneurs tend to establish person-to-person relations	Used to be true in Russia. There is a tendency for a wider emergence of market and hierarchical links	True
▪ Informal interactions at the individual level are perceived as more manageable	Somewhat true. Formalisation of relations is also important	True
▪ Different ties might be needed in the different stages of a company's development	True	True

This study, which focused on Russian SMEs characterised by different degrees of innovation, confirmed that the main purpose of building a network of business contacts was to create a pipeline for the knowledge, experience and resources necessary to build a business that proved propositions found in the literature. The study highlighted the differences in how entrepreneurs in these categories built and governed their business networks, which reflected the range of tasks they needed to address to ensure the successful operation of their businesses (for more details see Table 3.16). The differences also reflected the scale of the market in which they intended to conduct business, the geographical range of the resources necessary for building operations, and the degree of newness of their product or service.

The research presented here showed that the more local a company's market was from the point of view of its customer base and the more it was satisfied with the spectrum of suppliers available on that local market, the smaller was its network. The findings also revealed that the less innovative a company was, the more its ties were built around itself. For example, each company in the IC-very low category had an elongated vertical structure of contacts, in which the company itself was in the centre. From that vantage point, these companies focused on ensuring customer loyalty and maintaining profitable relations with suppliers. They relied on the recommendations of those in their close circle (friends and relatives who had relevant experience) as evidence of partner's reliability, tried to formalise contractual relations and attempted to rationally assess the benefits of cooperation. Entrepreneurs demonstrated an intuitive understanding that finding a new partner and integrating it into the firm's business processes not only incurs transaction and coordination costs but also bears reputational and operational risks. Therefore, they established relationships as necessary, and those relationships tended to be formalised. At the same time, firms in this category saw more of a need to establish dyadic ties with

partners than to build their relations within the framework of an integrated network of contacts.

For companies in the IC-low and IC-medium categories, this structure was supplemented with ties with larger numbers of partners, as well as horizontal relations with companies representing their own and related industries. This reflected the increasing complexity of the products and services offered by these companies, which required some form of infrastructure for their production and distribution. For example, an IT company developing IT solutions for the automation of corporate-governance processes had to actively interact with computer-equipment manufacturers. At the same time, the sphere of IC-medium companies' contacts expanded relative to that of companies in the IC-low categories. This was the result of the more active involvement of representatives of the scientific community in the former, which was necessary to improve the technologies underlying those businesses. It also reflected the more active involvement of these companies in international cooperation owing to the technological backwardness of Russian industries. As a result of this backwardness, IC-medium companies were unable to find the necessary equipment and components on the national market.

The widest networks were maintained by highly innovative companies (IC-high) comprising both vertical and horizontal relations (see Table 3.14). Moreover, highly innovative companies in the IC-high category felt that formal channels and contractual relations would not work unless contact was established with the right people at the right level. Respondents in highly innovative companies pointed out that business relationships had to be built on personal grounds in order to increase trust. In other words, contact with partners should be established at the person-to-person level. According to innovative entrepreneurs, purely formal relationships do not work in business. This behaviour can be explained by the desire to minimise risks and reduce uncertainty inherent in innovative endeavour. Personal contacts allow partners to bring relationships that have been created on paper to life:

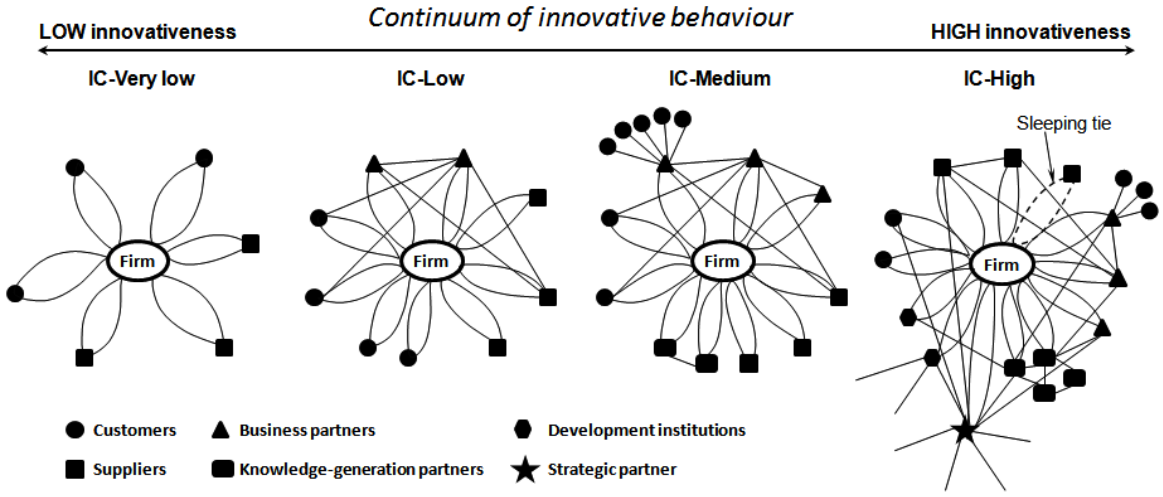
While companies in other categories indicated that their relationships faded away as certain tasks were fulfilled, companies in the IC-high category had a large number of "sleeping contacts". This meant that start-ups in this category had the largest networks. The breadth and volume of these networks was explained by the wide spectrum of multidisciplinary tasks that these companies faced, and their need for iterative interactions with their contacts due to the recurring nature of the innovative product-development process.

Respondents in all categories noted the importance of referrals and recommendations, which allowed for assessments of the possibility of establishing a trusting relationship. At the same time, the more high-tech a company was, the more often the respondents found it difficult to find the necessary recommendations given the novelty of the projects. In general, innovative companies demonstrated a higher degree of openness to building trusting relationships with new partners.

The analysis of the answers from innovative manufacturers revealed that the most difficult periods for these companies were the transition from laboratory research to the experimental stage and then the transition to small-scale (pilot) production that had to be done at the start-up stage of development. These periods were the most difficult owing to the unavailability of financial resources and the challenge of finding strategic partners interested in providing assistance (e.g., equipment for starting production). Consequently, during these periods of firm's development it was required to establish the maximum number of contacts. Spin-off companies, such as Mereya Cosmetics or SunProtein, which were created as a result of larger companies' diversification and had support from their parent companies, experienced fewer difficulties and were more actively developing. This was primarily due to the availability of their parent companies' networks the use of which made it easier for them to attract the necessary contacts.

The increase in interdependencies among connections in entrepreneurs' networks is visually presented in Figure 4.1.

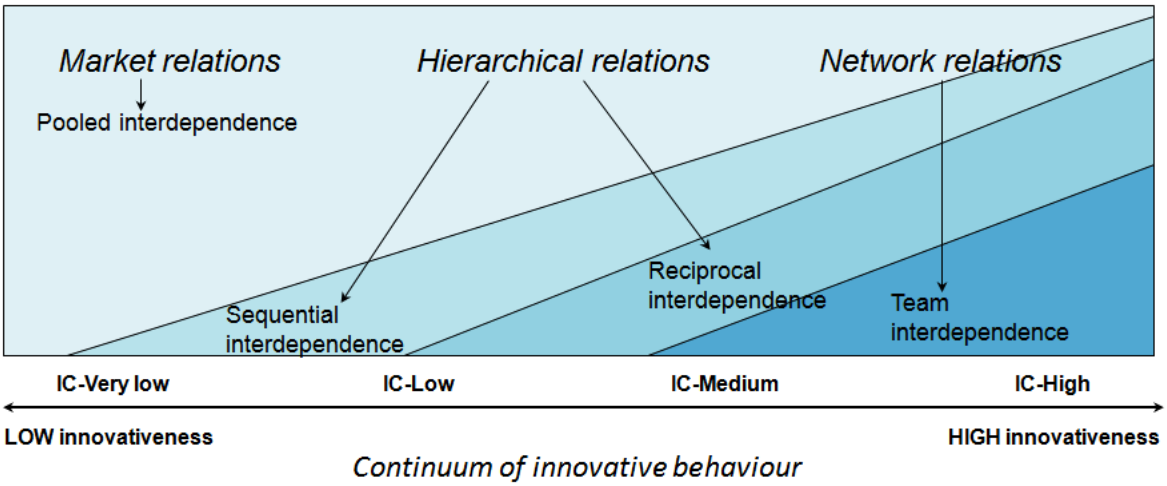
Figure 4.1. Increase in complexity in the system of relations depending on the innovativeness of the focal firm



Source: Developed by the author

Using the terminology proposed by Hämäläinen (2001; see Table 1.5., Chapter 1) we suggest that as the company's degree of innovativeness increases, the composition and predominance of individual types of interdependencies change (see Figure 4.2). On the one hand, this increases transaction and coordination costs, and amplifies the risks associated with a firm's networking due to the growing complexity of interactions. On the other hand, it is perceived as an inevitable necessity given the need to create something new, which can only be achieved through joint efforts.

Figure 4.2. Types of interdependencies typical for firms with various levels of innovativeness



Source: Developed by the author

Figure 4.2 helps forming a general conceptual understanding of the development of horizontal and team-based relations as business innovativeness increases. However, it should be used while taking into account the specifics of the interactions that arise in individual industries. Although the comparison of the networking behaviours of start-ups in different industries (i.e., IT companies and manufacturers) conducted in this study generally showed no fundamental differences in terms of the approaches used to govern networks, some specificity was revealed. Thus, IT companies usually had smaller networks, as they did not need to solve the wide range of tasks faced by manufacturers. In general, IT companies had shorter production cycles and most functions, such as software development and internet marketing, could be handled by employees, which reduced the need to build an extensive network of external contacts. The main sources of contact highlighted by IT companies were the professional community and clients, from which they derived ideas for creating and improving their products.

Thus, the findings in this study suggest that existing cognitive frameworks covering the networking behaviour of entrepreneurs should be supplemented with the degree of their innovativeness. This will help avoid the common mistake of offering representatives of traditional businesses an opportunity to more actively create networks and expecting them to do so. If these businesses do not need to solve new tasks related to, for example, the expansion or diversification of a business, they will find it unnecessary to expand the scope of their contacts, as doing so increases their costs and carries risks. Also, the findings indicate that state policy-related recommendations to apply push and top-down approaches to create more space and mechanisms for communication and to encourage start-ups to enter and use this space will result in a waste of funds with few positive effects. As long as firms do not need to expand their connections due to the specifics of their business, the opportunities provided to them will go unused. A pull approach based on the initiatives of firms or their professional associations, which are better able to understand their needs than the state, is more effective. At the same time, the understanding that the formation of ties is vital for innovative firms allows for a focus on ways to help reduce the transaction costs associated with finding the right partners in all circles of interaction – institutional, market and professional (see Table 1.10). Such mechanisms might focus on information spaces, physical venues and innovation-related fora for communication. Notably, one must not forget that excessive bureaucracy when, for example, dealing with development institutions increases coordination costs and can prevent firms from establishing relations with them.

4.1.2. Evolution of networks

The results of a comparison of this study's key findings with ideas from the literature are summarised in Table 4.2.

Table 4.2. Comparison of this study's and literature findings regarding the evolution of networks

Key ideas found in the literature	Findings from this study	
	Conventional businesses	**Innovative business**
▪ Networks develop over time	True, but networks not necessarily grow	True
▪ Entrepreneur's relationships tend to start off as relatively formal and then evolve into friendlier versions	Confirming and refuting examples are found	More likely to occur in this way, but not always
▪ Embedded ties can provide benefits but sometimes can harm the development of the business	True	True

The data confirmed the assumptions found in the extant literature that entrepreneurs' networks and their networking behaviour evolve over time. The data also revealed that

relationships evolved differently in companies belonging to the various innovativeness categories. In particular, the evolution of relations with customers needs to be separated from the evolution of relations with partners and suppliers. The analysis showed that, for companies in the IC-very low category, the network of client contacts and the network of contacts with suppliers both typically reached saturation in terms of volume. This saturation point was determined by the business's production capacity, although individual participants in the network could be replaced over time. The networks of companies in the IC-low category tended to reach a point of stabilisation and then only evolved slightly. This was explained by the peculiarities of this type of business, especially the fact that they were often built on formalised, long-term relationships, such that changes in the network were not desirable. Innovative companies' networks developed more dynamically. For companies in the IC-medium category, this evolution was determined by the necessity of constantly developing their products. For the most innovative companies (IC-high), network development was due not only to the activities needed to commercialise their technologies but also to the need to develop the market and the industry. Therefore, innovative entrepreneurs in the IC-high category eventually formed several interconnected networks of business contacts aimed at supporting various projects with both business and social value. Thus, this observation expands the conceptual understanding found in the literature of how innovative companies form their networks of business contacts.

This study provides evidence that contradicts the proposition found in the literature that an entrepreneur usually transforms business contacts into friendlier, more personal contacts over time. Although examples confirming this type of evolution were found, examples indicating the opposite were also uncovered. The research presented here also showed that this type of evolution depended on the context of the relationship and the psychological readiness of the entrepreneur. For example, Russian entrepreneurs who started their businesses during the difficult years of the collapse of the Soviet Union, *perestroika* and the post-*perestroika* recovery tended to separate business activities from their personal lives. Therefore, their business relations did not evolve in this manner. At the same time, young entrepreneurs, especially innovative ones, demonstrated a clear readiness to build friendly business ties and to give partners more trust from the very beginning.

The study confirmed the existence of risks and barriers to business development resulting from highly embedded ties, which have previously been identified in the literature. The use of informal personal relations to improve the manageability of business relations (which is a characteristic of transition economies) has the opposite effect. In this study, respondents in all categories noted that it is necessary to not only pay attention to finding contacts and

managing relationships, but also to exit those relationships if they become obsolete, and to do so without damaging the firm's operational processes or reputation. The data analysis did not provide insights into patterns that might help resolve this problem. Each individual case faced by an entrepreneur was the subject to his or her situational decision, which was often suboptimal and typically led to a loss of friendship, funds, company destruction or moral damage. Notably, this problem remains poorly researched and rarely examined in the literature, which suggests that the topic of ending relations in business would be a fruitful area for further research.

4.1.3. Role of trust in building a business relationship

This study largely confirmed the main propositions found in the literature (see Table 4.3).

Table 4.3. Comparison of this study's and literature findings regarding the role of trust

Key ideas found in the literature	Findings from this study	
	Conventional businesses	**Innovative business**
▪ Interpersonal trust is an important mediating factor influencing the networking behaviour	To some extent true Formalisation of relations is important	Highly true
▪ Trust between business participants change over time	Trust can both grow and fade away	Trust can both grow and fade away
▪ Trust increases from the positive outcome of repeated interactions	True	True

For entrepreneurs who participated in the study, interpersonal trust is an important mediating factor that influences networking behaviour. Trust acts as a guarantor in terms of optimising costs and minimising the risks associated with opportunistic behaviour in relations. This study results highlight different patterns of networking behaviour backed by different attitudes towards trust in the various innovative categories.

The highest degrees of readiness to trust and openness to building friendly business relations were demonstrated by highly innovative companies (IC-high category). For entrepreneurs from this category, the rapport between participants in the relationship, which was based on common values and interests, was of particular importance. These common values and interests related not only to material elements but also to creating something new through joint efforts. Thus, for innovative entrepreneurs, the key element in decisions to establish business relations is affective trust. However, the behaviour of innovative start-ups differed significantly from what is described in the literature. In view of the technological complexity of these businesses, network building cannot be based on recommendations from an individual's close circle. Moreover, professional relations sometimes developed into friendly relations.

In contrast, less innovative entrepreneurs (in IC-medium category) are mostly guided by the model described in the literature when establishing and governing new business relations. Respondents in this category are willing to enter into new relationships based on trust even though they know that they are taking certain risks. While dependence on a business partner can be assessed as average, the high degree of specificity of complementary competencies that the entrepreneur seeks from the relation is an issue. This explains why it is perceived as appropriate to accept risk. Entrepreneurs in this category tend to build business relations by relying on cognitive trust trying to find some evidence of trustworthiness, including through recommendations of those in their close professional circle, to minimise risks and costs:

Of all of the respondents, those in the IC-low category demonstrated the most rational and prudent approach to all issues, including questions of what constitutes the basis of trust. They claimed that one must base all decisions on rational considerations and calculations, trust should be deserved, and all relations should be backed up with contracts. Respondents in this category rely mainly on behavioural trust, which suggests that perceived interdependence on other participants of their business network is not high and that there is a pool of potential partners from which to choose (i.e., transaction costs are not perceived as very high). However, the reliability and trustworthiness of the partner allow for economising on coordination costs in the long term. Thus it can be concluded that for companies in the IC-low category, trust is necessary for ensuring the effectiveness of key business processes.

Interestingly, the results highlighted a similarity between traditional companies' networking behaviours (IC-very low) and the networking behaviours of highly innovative companies (IC-high). For entrepreneurs from these categories, networking was a tool useful for forming a certain environment in which it was comfortable to exist. Moreover, entrepreneurs from these categories found it natural to build more trusting relationships with their contacts based on the convergence of values. These relationships subsequently became friendlier. This can be explained by the fact that it was natural for respondents in these categories to perceive the building of their companies as the meaning of life rather than as a narrow, utilitarian way of earning money.

This study also showed that trust between business participants changed over time, but it did not necessarily develop over time. The data analysis also revealed that companies in different categories perceived the basis of trust in different ways, and that they had different dynamics when forming trusting relationships. Nevertheless, trustful relations often developed due to interactions aimed at providing mutual assistance, especially in

difficult periods. It can be concluded that the level of trust grows when repeated interactions have positive outcomes, thus proving that the behavioural aspect of building trust is important. At the same time, relations often faded as a result of a party's failure to live up to obligations. These findings are in line with the observations found in the literature. However, there were found some differences in how trust is affected by failing to meet obligations and keep promises in different categories. Only one category of entrepreneurs, IC-medium, demonstrated relative tolerance of a partner's faults if there was some awareness of that partner's professionalism and its readiness to correct mistakes. In other categories, the level of tolerance was low. In the IC-low category, a breach of obligations was perceived as contrary to the rules of doing business, especially when agreements are secured by contracts. In the IC-very low and IC-high categories, the low level of tolerance was explained by the fact that relationships were more personal. Therefore, a violation of agreed obligations was perceived as a sign of disrespect for the interests of the partner, which led to personal insults and a break in ties.

The conceptual understanding of the mechanisms of trust used by different types of SMEs developed in this study should be of interest to managers. The discussion of differences in companies' understandings of the appropriateness of trust mechanisms, which give rise to different networking behaviours, should allow managers to avoid common mistakes. Such mistakes often occur because managers fail to consider the possibility that their business partners might be in a different innovativeness category and, therefore, may value different aspects of trust (affective, cognitive or behavioural). As shown in this study, an inability to understand the interests of the other side often creates problems in otherwise trusting relationships. For example, a number of companies belonging to the IC-low category are likely to simultaneously be suppliers for companies in the IC-very low category and distributors for companies in the IC-medium and IC-high categories. Therefore, an understanding of differences in the mechanisms for building and managing business relationships in all categories can make all value-chain participants more effective.

4.1.4. Role of previous entrepreneurial experience and education in networking behaviour

The results of a comparison of this study's key findings with ideas from the literature are summarised in Table 4.4.

Table 4.4. Comparison of this study's and literature findings regarding the role of experience in networking behaviour

Key ideas found in the literature	Findings from this study	
	Conventional businesses	**Innovative business**
▪ Previous entrepreneurial experience and education influences the process of acquiring resources through networking	True	True
▪ Novices and experienced entrepreneurs behave differently in relation to networking strategies and tactics	True. Experienced entrepreneurs are more active in networking striving to improve quality of contacts	True. Experienced entrepreneurs become the core of intra-industry networks, uniting the efforts of diverse participants of the NIS.

This study showed that the acquisition of entrepreneurial experience changed the networking behaviour of start-ups and enabled them to expand their range of contacts. With the acquisition of entrepreneurial experience, entrepreneurs began to better understand the advantages that networking provides, and to see and manage the risks associated with it. In general, representatives of traditional companies improved the quality, rather than the breadth, of their networks as they gained experience. The more innovative the company was, the more the entrepreneur expanded the network of contacts as he or she gained experience. Entrepreneurs in all categories noted that network-building skills as well as the ability to properly position themselves and their companies in the appropriate business environment evolved as entrepreneurial experience increased. Several respondents noted a need for higher-education institutions to purposefully strengthen skills in building and governing networks.

The study revealed that younger entrepreneurs often make decisions about new ventures by relying on their existing circles of contacts, which serve as the starting point for building their business networks. The more professional or more scientific that circle is, the greater the likelihood that a young entrepreneur will engage in a more innovative business. As entrepreneurs gain experience and develop communication skills, their network-building tactics change. In the beginning, as unknown novices representing new ventures, the entrepreneurs seek out contacts somewhat randomly. Later, they adopt a more planned approach in which they rationally assess which contacts can be made and for what purpose. Second, entrepreneurs move from a position of seeking out contacts toward putting themselves at the centre of communications to more efficiently create the network they need. At the same time, innovative start-ups assume responsibility for the development of the market and the industry by expanding information and creating networking opportunities for interested parties. The more innovative a start-up is, the more likely it is to create a network of contacts that solve broader tasks than just creating a company and

launching a product on the market. This approach is self-reinforcing. As a firm's history and its reputation in the market grow, it becomes easier to find the right partners for new endeavours.

In this study, it has also been suggested that previous entrepreneurial or management education can have an impact on networking behaviour. As expected, not all entrepreneurs participating in this study had a basic economic or entrepreneurial education. However, only somewhat successful start-ups that had already launched their product on the market or had made major progress in that direction took part in this study. Given this sample, it was impossible to accurately assess the extent to which a managerial education was critical for successful networking. Notably, some respondents stated that their lack of management education was offset by either the presence of a co-founder with a relevant education or their own extended experience in a large company where they had acquired the necessary knowledge. A number of young entrepreneurs said that their lack of entrepreneurial experience and business knowledge hampered their activities. Representatives of low-innovative companies acquired the necessary knowledge by obtaining advice, mainly through communication with a close circle of friends and relatives who had relevant experience. Representatives of innovative companies, especially in the IC-high category, were more likely to acquire this knowledge on the open market through participation in paid, widely advertised, short-term educational programmes and activities in the field of entrepreneurship. Alternatively, they obtained it from mentors who were experienced entrepreneurs. Respondents noted that the latter method was more effective, while paid educational programmes were often of poor quality. Moreover, respondents pointed out that participating in innovative forums could be useful, as one could learn new trends and find the right contacts. Contradictory opinions were expressed regarding the effectiveness of accelerator programmes, and reactions to these programmes ranged from refusal to participate due to a perceived high degree of bureaucratisation to a high degree of satisfaction with the results.

Entrepreneurs noted that the educational programmes in which they participated were unbalanced in terms of theory and practice. More specifically, if a programme was offered by a university, it was too theoretical. If it was offered by an accelerator organised to support start-ups, it consisted of a set of actions that needed to be completed and then reported. However, the instructions issued to the accelerator participants were not accompanied by sufficient explanations of why these actions were necessary and there was no subsequent analysis of what could be done differently. This observation led to the

conclusion that it is necessary to develop an educational project that would organically combine the theoretical and practical components, help students understand the role of networking in innovation, and assist them in acquiring and mastering networking skills.

4.2. Contribution to practice

A key contribution to practice emerged in the sphere of the professional capacity of this thesis's author (i.e., her teaching and administrative activities at the Lomonosov Moscow State University Business School). More specifically, the results of this study were applied in the construction and implementation of an educational project designed to enhance student learning. At the same time, that project had an external impact in terms of helping technological entrepreneurs establish vital contacts in the business and market environment. This project was carried out with the support and active participation of the Skolkovo Foundation, which aims to assist start-ups in launching technological products on the market. The project's implementation also helped to improve the effectiveness of the start-ups' marketing activities that were supported by the Foundation. In particular, it increased the effectiveness of the start-ups' participation in the international professional fair Batimat-2018 in Russia.[51]

This study has shown that networking plays an important role in increasing the effectiveness of commercialisation processes. However, as the respondents pointed out (see Chapter 3), communication skills and experience are needed in order to network effectively. This suggests that if current students are to become entrepreneurs, higher-education institutions should not only provide theoretical knowledge but also teach networking skills and create a networking environment that can serve as a context for students' entrepreneurial development.

The practical implication of this study was the inclusion of a "Foundations of Creating Your Own Business" course in the curriculum for second-year students at the Lomonosov Moscow State University Business School. The elective course was introduced in the spring semester of the 2017-18 academic year. Students who took the course already had basic knowledge of entrepreneurship. The findings of this study laid the foundations for the theoretical part of the course. More specifically, the frameworks presented here were used for in-class discussions of the role and significance of networking in the context of an innovation system. The theoretical component was supplemented with a practical project in which groups of students were formed and attached to five technological start-ups that

[51] https://batimat-rus.com/en/.

were residents of the Skolkovo Technopark and were under the patronage of the Skolkovo Foundation. The participation of start-ups in the Batimat-2018 professional fair (3-6 April 2018), which was subsidised by the Skolkovo Foundation to provide support in commercialising technological solutions, was the focal event for the project. A detailed description of the stages of the project is presented in Appendix 4.1. The students worked under the guidance of the course instructor, but the students had some freedom to utilise their own creativity.

The main idea of the course was to create a unique learning environment in which students (i.e., future entrepreneurs) could not only see the theoretical importance of creating networks for innovation management but also become part of such a network in order to promote an innovative product. In this regard, they had an opportunity to master the theoretical concepts through the application of knowledge in real-life situations, which contributed to the development of relevant skills. Students interacted with technological entrepreneurs with the aim of helping entrepreneurs better understand opportunities to develop a systematic approach to building business networks conducive for bringing technology-driven, innovative products to the market. The Skolkovo Foundation supported the practical project implemented as a part of the course by selecting the start-ups that would participate, providing moral support and information to students and start-ups, facilitating interactions between project participants (i.e., students and start-ups), and hosting two high-value meetings with start-ups at the Skolkovo Technopark (a kick-off meeting and closing event at which students presented their results to start-ups and the broader Skolkovo community). The results of the students' work were provided to start-ups at no charge. As such, the project brought together three groups of actors who found synergies in the interactions within the NIS, as presented in Table 4.5.

Table 4.5. Project participants

Knowledge-generation system	Lomonosov Moscow State University Business School, teachers (2 people)[52] and students (9 working groups, an average of 7 people each; a total of 62 undergraduate students of the second year)
Development institution	Skolkovo Foundation, represented by a curator of the "Energy-efficient technologies and technologies in the sphere of housing, communal services and municipal infrastructure" cluster
Knowledge-application system	Five companies within the cluster receiving support from the Skolkovo Foundation ▪ Rubetek – smart home systems ▪ AMT – 3D printer for building houses ▪ Ecolight – device for protection against sparks ▪ Insolar – household- heat recovery valve ▪ Revolta (AllGateKeeper project) – equipment for remote management of parking and access to various premises

[52] The course was designed and implemented by the author of this thesis with administrative help provided by a junior lecturer from the Management Department.

This project was implemented to help solving several tasks:

- **For start-ups**: To systematise approaches to the development of necessary business contacts and to acquire new, useful business contacts with the help of students.
- **For the Skolkovo Foundation**: To provide practical assistance in increasing the effectiveness of start-ups' participation in the professional fair, and to identify areas in the development of market and professional networks in which start-ups required help.
- **For students**: To obtain practical experience in planning and attracting necessary business contacts.
- **For the business school**: To increase the effectiveness of education and ensure that students develop practical competences that they could later apply in their professional activities

In general, most student groups coped with the assigned tasks. However, two teams that carried out the project for one of the start-ups struggled with communicating with that start-up's representatives early in the process. Those representatives had adopted the position of "We already know what we need to do. We are not ready to look for contacts and doing so is a waste of time". Therefore, these two groups spent a significant amount of time on convincing the start-up of the usefulness and expediency of networks, and they even helped the start-up find useful contacts. All student groups worked at the professional fair and presented their results in Skolkovo on the final day (see Figure 4.3).

Figure 4.3. Photos of project participants

Positive feedback on this project was received from representatives of the start-ups, who said that the students' involvement allowed them to take a fresh look at the issue of network building:

> When we were told about this project, I thought, "Well, another unnecessary initiative introduced by Skolkovo". We participated in it simply because Skolkovo insistently asked us to do so. We did not really expect a result. We believe that we have a strong technology and that it will break into the market. The students saw everything from the other side – they forced us to move, to consider how best to structure our external relations, to find missing links and to consider where to find new contacts. In general, it was unexpectedly useful for us. (Alexander, Revolta)

> I am grateful to the Business School and Skolkovo for this project. The students were very active and helped us a lot in preparing for the fair. In my opinion, their involvement increased the effectiveness of our participation in the fair, not only because they provided us with extra hands, but also because their creative brains helped us structure our work and establish necessary contacts that we did not consider or care about beforehand. We will continue to cooperate with students in other projects with pleasure. (Alexey, Rubetek)

Moreover, some students were invited by some start-ups to continue cooperating on network development.

A representative of the Skolkovo Foundation noted that it was not very easy to convince start-ups to take part in the project and that there were difficulties in the course of its implementation. However, in his opinion, a positive effect was ultimately achieved:

> Not everything went smoothly – not all start-ups could easily find a common language with the business-school students. Our innovative start-ups are mostly created by scientists and engineers, not by businessmen. Therefore, they are mainly about the development of technology, and not so much about the business, the market or effective networking. Systemically, it is very important to have examples of successful, growing technological start-ups. I think that this project helped all of the participants. We will continue to cooperate with the Business School. (Yuri, Skolkovo Foundation)

The students indicated that the course was very useful because it combined theoretical and practical components. The students also noted that as start-ups were mainly focused on technology development, they often did not understand their clients:

> I liked the course. I not only learned useful things but I was also able to do something real. It was not easy. It is one thing to sit in an audience listening to theory and another to put that theory into action – to understand with whom it is necessary to build interactions and how to find contacts, and then to go and talk with those contacts and convince them to work with you ... I think it will be useful in my career. (Maxim, student)

> When you sit in class and listen, everything is simple. However, it is hard to do the things we discuss in class in reality. We had a great start-up. I think we learned a lot from the business and that it learned a lot from us. (Natasha, student)

> We felt that the start-up did not understand who their client was, where to look for that client or who could help in this regard. We would say, "Let us try it … We can do this". They would say, "Well, that is not really necessary. The market will somehow appear on its own", but they did not know how. We were able to draw the start-up's attention to important market-related aspects, which should help it to develop faster. (Anna, student)

The significance of this project as a practical application of the findings of this study is that it allowed for the testing of the assumptions formulated in the framework of the study (e.g., about cognitive gaps, the cautious attitude of start-ups toward development institutions) on an independent sample. In addition, it allowed for a test of the logic of a systematic approach to the search for and establishment of network contacts to facilitate commercialisation. This project is scheduled to be repeated within the framework of the cooperation with the Skolkovo Foundation in 2019.

4.3. Limitations of the study and recommendations for further research

The research presented in this dissertation consisted of three fundamental blocks: a literature review (Chapter 1), a documentary study on the evolution of the Russian NIS (Chapter 2) and a primary study involving the analysis of qualitative data collected through interviews with Moscow-based entrepreneurs. All blocks were interrelated, and the results obtained at each stage had implications and risks for the design of the next stage and the researcher's decisions in that stage, as shown in Table 4.6.

Table 4.6. Reflections on the limitations of this study

Research phase	Contribution to the study's logic	Implications for the next stage	Risks
Literature review (Chapter 1)	Considered the three fundamental areas (innovation, networking, NIS), which formed the basis of the study's conceptual framework.	The concepts revealed in the literature determined the author's understanding and allowed for formation of a conceptual apparatus that included the key analytical categories used as the basis for the analysis performed in Chapters 2 and 3.	Important theoretical aspects could be missed, which could lead to a distortion of the conceptual space and create cognitive limitations owing to the non-inclusion of important categories in the analysis.
Documentary study (Chapter 2)	Based on the analysis of the documents, five phases of the Russian NIS's development were identified. The specific features of the Russian NIS were considered, which served as the context for studying the role of networking in innovation.	The results of the analysis allowed for: - Selecting the scope of the research and narrowing the scale of the phenomenon in relation to which networking would be considered. That phenomenon was defined as "Entrepreneurial projects that resulted in the launch of a concrete offering in the market by Moscow-based SMEs". - Determining the meaning of "innovative company" in Russia. - Forming a cognitive framework for understanding the discourse of entrepreneurs in terms of factors and	- Some important facts and events that influenced the formation of NIS or that its actors perceived as related to the benefits, opportunities, costs and risks of networking might not be included in the analysed set of documents, which could distort the author's understanding. - The complexity, multiplicity and interdependence of certain factors affecting the development of the

		motives related to the external environment.	NIS in Russia could lead to a misinterpretation of cause-effect relationships. - The bounded rationality of the author could affect the interpretation of the relations.
Qualitative research (Chapter 3)	Based on the study's design (the author's approach to the formation of innovation categories) and the collected data, conclusions were drawn about the existence of different patterns in the behaviours of various groups of entrepreneurs.	- The proposed approach to the classification of firms might not be optimal in terms of obtaining groups relevant to the study. - The data-collection strategy could result in a biased sample. - The number of respondents in each group was small (e.g., 12 and 10 respondents in the IC-medium and IC-high categories, respectively), which might not allow for valid generalisations (construction of ideal types). - Respondents might provide insincere, socially desirable answers. - The data-collection tool (i.e., the questionnaire) could limit the ability to collect relevant data. - The analytical methods (i.e., grounded theory and ideal-type analysis) could lead to incomplete findings.	- Features of the study's design could lead to incorrect conclusions. - The sample used for the interviews could have peculiar features that might predetermine the findings. - The cognitive abilities of the author and her bounded rationality could lead to distortions in the similarities and differences among the behaviours of entrepreneurs belonging to different groups, and in their interpretation.
Contribution of the research (Chapter 4)	On the basis of the findings, conclusions were drawn on how cognitive frameworks should change with regard to networking and its role in innovations. A practical-oriented learning project was developed to enable students to assist start-ups in the development of innovations. Recommendations were made for further research.	- The author's conclusions and generalisations could form a distorted picture that does not reflect the actual situation. - Specific features of the development of the Russian NIS (e.g., path dependence) could determine the results and the identified cause-effect relationships. They might make it impossible to extend the findings to the contexts of other developing or developed economies.	

The main limitations inherent in the study, which may affect the quality of findings and ability to effectively answer research questions, are directly related to the risks listed in Table 4.6 and can fall into the following areas: design limitations, data limitations and

impact limitations. The main *design limitation* is that the grouping criteria used in this study (see Chapter 3) do not break the sample down into distinct groups for individual questions. Therefore, the conclusions that are based on that categorisation may be not valid. An explanation of the rationale behind the grouping approach is provided in Section 3.2.1. As the research was qualitative and was aimed at finding evidence of the possibility of formulating hypotheses concerning various networking mechanisms for companies with different degrees of innovation, this approach is still considered appropriate. Nevertheless, to verify the validity of this study's conclusion about the relationship innovativeness and networking patterns, a quantitative study on the basis of a representative sample could be used. This approach would allow for the statistical determination of clusters exhibiting similar patterns of networking behaviour. Furthermore, the grouping could be analysed in an attempt to confirm the hypothesis that traditional and innovative firms belong to different clusters in terms of networking behaviour.

During the interviews conducted within the framework of this study, representatives of innovative companies mentioned different models for income generation based on: (a) the extended development of their companies and the growth in sales of the created product or service; (b) the development and sale of the business to a strategic investor; (c) the transfer of rights to use inventions and technologies, and (d) the satisfaction of peak demand in the market in the short term by commercialising a developed technology (mainly for IT solutions). The expediency of dividing the array of innovative high-tech companies not into two groups (as in this study) but into four groups was also confirmed in Andrushchak et al. (2018), which was published a year after this study took place. Thus, the characteristics of networking behaviour appear to be related not only to the firm's degree of innovativeness, as shown in this study, but also to the income-generation model resulting from innovation activity. This assumption requires testing within the framework of further research.

The main *data limitation* relates to the fact that the sample of respondents is unrepresentative and small, especially with regard to innovative companies (22 companies participated in the survey). However, as the research is exploratory in nature, the results can be interpreted and used as a starting point for further research.

The strategy of finding respondents representing firms in the IC-medium and IC-high categories through referrals from NIS development institutions (i.e., RVC, Skolkovo, IIDF and Technopark Strogino) might have led to some selection bias. More specifically, it might have resulted in the selection of start-ups that had successfully commercialised their

ideas and technologies – start-ups that these development organisations were not ashamed to recommend. This, in turn, might explain why the start-ups studied in the primary research (see Chapter 3) generally demonstrated a more positive attitude towards networking and more actively used networking than some of the innovative start-ups that participated in the educational project (see Section 4.2.). Thus, this study's findings regarding the behaviour of start-ups in the IC-medium and IC-high categories might not have reflected the average behaviour of innovative firms, but instead constituted examples of best practices in the relevant categories. However, the practical value of this study lies in the development of recommendations and strategies for companies to improve their innovative capabilities through the use of networking. Therefore, this feature of the sample does not pose a threat to the validity of the recommendations. At the same time, in the future, researchers may find it fruitful to consider the influence of the intensiveness of networking behaviour and its characteristics on the firms' success and the speed of commercialisation of innovative ideas and technologies. Other interesting questions that deserve the attention of researchers in light of this study are the following: Is it possible to make conventional businesses more innovative and, consequently, more competitive through networking? If so, what characteristics should such networking have?

The primary study used the opinions of entrepreneurs representing Moscow-based firms, which gives rise to the main *impact limitation* of this study. The strong national and regional focus might mean that the differences revealed in the networking behaviours of traditional and innovative companies may reflect the influence of factors other than innovation factors. These factors could relate to the external business environment in Russia and features of its historical development (as discussed in Chapter 2), or to the inertia common among entrepreneurs who grew up in periods when there was essentially no innovation system in Russia. Therefore, the findings derived from this study cannot be reliably extended to other developing or developed economies. At the same time, Moscow has a highly developed RIS (see Section 2.4.). Therefore, the conclusions made in this study may still be relevant for interpreting networking behaviour in other contexts. As such, future research may aim to identify how the country and regional contexts influence the networking behaviour of traditional and innovative companies.

4.4. Conclusions

This DBA thesis presents a comprehensive study on the role of networking in innovation in the context of Russia. This issue is considered in terms of identifying the relationship between the innovativeness of SME and its networking behaviour. The study starts from a critical evaluation of the relevant extant literature on innovation, networks and national iinovation system. In the second chapter it proceeds with the analysis of the trajectory of NIS development in Russia to build an understanding of the context of the research. In the third chapter it investigates the networking behaviour of Russian SMEs, represented by a sample of 59 companies that launched business activities in Moscow between 2009 and 2017. In the last chapter, the findings are discussed and compared with propositions found in the literature to determine this study's contribution to knowledge. The implications for practice that emerged in the sphere of the author's professional capacity are also examined, as are the limitations of the study. Moreover, suggestions for further research are provided.

It is shown in the study that entrepreneurship is a new phenomenon for Russia, as it has only been developing since 1992. In the Russian economy, which has historically been dominated by the public sector in terms of supply and demand, starting and running one's own business has never been a widespread activity. This was mostly due to the lack of a belief that entrepreneurship could be a suitable method for achieving one's own personal goals in the context of Russian emerging economy. Moreover, the perceived risk associated with organising one's own business was high due to inadequate entrepreneurial infrastructure and administrative barriers. To support innovative and entrepreneurial activity, in recent years, a significant amount of resources has been directed at creating a relevant infrastructure in Russia and lowering the administrative barriers. However, despite these efforts, Russia's entrepreneurial and innovation activity still lags behind the level of development evident in the leading countries. The existence of basic framework conditions by themselves do not guarantee that more companies will emerge and that they will be more innovative. As literature suggests, SMEs must engage in external interactions and develop networks of business contacts in ways that help them to be maximally effective in their entrepreneurial and innovation efforts. Although Russian SMEs may establish these

relations, knowledge of the forms and strategies of networking that are the most fruitful for companies to achieve their goals is lacking. In this regard, the study builds an understanding of the networking behaviour of Russian both non-innovative and innovative SMEs and in particular highlights the role of networking in innovation.

From a theoretical point of view, the study's main contribution lies in the extension of the extant literature to include the role of networking in innovation in transition economies. At the same time, the analysis shows that the business behaviour of Russian entrepreneurs is similar to Western norms of doing business in many respects. As a consequence, it is assumed that this study's findings will also be of interest to a wider range of stakeholders, as they can be extended to the context of developed economies.

From this point of view, the research presented here contributes to understanding of the mechanisms for building market and professional networks, including understanding of the evolution of entrepreneurial networks and the emergence of trust among entrepreneurs from companies characterised by different levels of innovativeness. The understanding developed in this study (e.g., the map of goals pursued by entrepreneurs in external relationships) allows us to systematically examine how entrepreneurs think when searching for external relations.

The results of the research presented here show that entrepreneurs underestimate the need to systematically approach the building and development of their networks. On the one hand, the findings allow entrepreneurs to better understand how they can systematically establish and manage external network links (i.e., communication, interaction and co-ordination) among people, teams or organisations (i.e., network nodes). This includes an understanding of the internal structures and resources that should be used to take advantage of the opportunities provided by external relationships and, thereby, improve the company's performance. On the other hand, the results provide development institutions with an understanding of the "nodes" (e.g., experts, teams and institutions) that should be brought together and the "links" (e.g., communications and interactions) among nodes that can be reinforced. In the current stage of Russian innovation-ecosystem development, these network opportunities should go far beyond the establishment of a platform for

communication between science and business. In fact, they should involve all participants in the market and professional spheres, and the constructive interactions of these participants should enable companies to develop successfully.

The findings provide companies with benchmarks in the form of best-practice networking models that are supportive of entrepreneurial and innovation activities. Furthermore, such an understanding not only assists in governmental decision making related to NIS development, but also allows other NIS actors, including higher-education institutions, to better support SMEs in their efforts. For example, this study's findings were implemented by the author to develop a course at the Lomonosov Moscow State University Business School that combined theoretical and practical components. The aim of the course was to allow students to put the knowledge obtained in class, which was based on the conclusions of this study, into practice to help innovative start-ups develop their professional and market networks. This course was also a practical example of a way of organising interactions among the university, start-ups and the development institution that is conducive to launching innovative products on the market.

References

Aarstad, J., Haugland, S. A., Greve, A. (2009) ‘Performance Spillover Effects in Entrepreneurial Networks: Assessing a Dyadic Theory of Social Capital’, *Entrepreneurship Theory and Practice*, 34, pp. 1003-1019

Aarstad, J., Pettersen, I., Henriksen, K. (2015) ‘Entrepreneurial experience and access to critical resources: a learning perspective’, *Baltic Journal of Management*, 11(1), pp. 89-107

ACGRF (2015) *Russia's entry into the socio-economic crisis: trends of 2015 and comparative analysis*. Analytical Center under the Government of the Russian Federation, Apr. 2015

Acland, S. (2011) *Angels, Dragons & Vultures: how to tame your investors - and not to lose your company.* Boston: Nicholas Brealey Publishing.

Ács Z.J., Szerb, L., Autio, E. (2016) *Global Entrepreneurship Index 2016.* Washington: The Global Entrepreneurship and Development Institute.

Adams, R., Bessant, J. and Phelps, R. (2006) 'Innovation management measurement: A review', *International Journal of Management Reviews,* 8 (1), pp. 21-47.

Adams, R., Bessant, J. and Phelps, R. (2006) 'Innovation management measurement: A review', *International Journal of Management Reviews,* 8 (1), pp. 21-47.

Agranovich, M. (2007) ‘Intellect on Growth. Young people can be returned to science in just five years’, *The Russian Newspaper*, No. 4332

Ahlstrom, D., Bruton, G. D. and Li, H. (2010) 'Institutional Theory and Entrepreneurship: Where Are We Now and Where Do We Need to Move in the Future?', *Entrepreneurship Theory and Practice,* 34 (3), pp. 421-440.

Ahuja, G. (2000) *The duality of collaboration: inducements and opportunities in the formation of interfirm linkages.* John Wiley & Sons, Ltd.

Aidis, R., Estrin, S. and Mickiewicz, T. (2008) 'Institutions and entrepreneurship development in Russia: A comparative perspective', *Journal of Business Venturing,* 23 (6), pp. 656-672.

Alekhina, M. (2017) *The government will cut spending on scientific research by 19 billion rubles*. [online] RBC. Society, Jan. 27, Available at: http://www.rbc.ru/society/27/01/2017/5889d8879a7947a91c8c62df [Accessed 20 Aug. 2017].

Aliaga-Isla R. (2014), ‘Informal Networks and Start-Up Entrepreneurs in Spain: Networking Other Entrepreneurs and Angel Investors’, *The Business and Economics Research Journal*, 7(2), pp. 167-178

Allahverdian, A. G. (2014) *Dynamics of scientific personnel in Soviet and Russian science: a comparative-historical study.* Moscow: Kogito-Center.

Alt, R. and Fleisch, E. (2000) 'Business Networking Systems: Characteristics and Lessons Learned', *International Journal of Electronic Commerce,* 5 (2), pp. 7-27.

Anderson, A. R., Dodd, S. D. and Jack, S. (2010) ' Network practices and entrepreneurial growth', *Scandinavian Journal of Management,* 26 (2), pp. 121-133.

Andreev, A. (2017) *The price of growth. Interview with Murychev A. Executive Vice President of the Russian Union of Industrialists and Entrepreneurs*. [online] Rossiyskaya Gazeta. Special Issue No. 7, 228 (62), Available at: https://rg.ru/2017/03/23/kakie-problemy-meshaiut-biznesu-v-rossii.html [Accessed 26 Aug. 2017].

Andrushchak, G. V. et al. (2018) *National Report on Innovation in Russia - 2017.* Moscow: RVC.

Antonucci, T. C. (2001) 'Social relations: An examination of social networks, social support, and sense of control', in Birren, J. E. &Schaie, K. W. (eds.) *Handbook of the Psychology of Aging.* San Diego CA: Academic Press, pp. 427-453.

Archer, D., Cameron, A. (2009) *Collaborative leadership – how to succeed in and interconnected world*. Oxford: Elsevier.

Ard-Pieter de Man (2004) *The Network Economy: Strategy, Structure and Management.* Cheltenham: Edward Elgar.

Armbruster, H., Bikfalvi, A., Kinkel, S. and Lay, G. (2008) 'Organizational innovation: The challenge of measuring non-technical innovation in large-scale surveys', *Technovation,* 28 (10), pp. 644-657.

Asheim, B. (2007) 'Differentiated Knowledge Bases and Varieties of Regional Innovation Systems', *Innovation: The European Journal of Social Science Research,* 20 (3), pp. 223-241.

Asheim, B. T. and Gertler, M. S.(2005) 'The geography of innovation: regional innovation systems', in Fagerberg, J., Mowery, D. and Nelson, R. (eds.) *The Oxford Handbook of Innovation.* Oxford: Oxford University Press, pp. 291-317.

Asheim, B. T., Coenen, L. and Svensson-Henning, M. (2003) *Nordic SMEs and Regional Innovation Systems.* Report for the research project. Department of Social and Economic Geography, Lund University, Sweden: Nordic Industrial Fund center for innovation and commercial development.

Audi, R. (2011) *Epistemology: A contemporary Introduction to the Theory of Knowledge.* 3rd edn., New York: Routledge.

Aulet, B. (2013) *Disciplined Entrepreneurship: 24 Steps for a Successful Start-up.* 1st edn., New York: Wiley.

Banche et al. (2016) *Russia online? Catch up impossible to fall behind*. [online] The Boston Consulting Group. Available at: http://image-src.bcg.com/Images/Russia-Online-ENG_tcm26-152058.pdf [Accessed 18 Aug. 2017].

Barancheev, V. P., Maslennikova, N. P. and Mishin V.M. (2009) *Innovation management*, Moscow: Jurait-Isdat.

Barnes, G. (1996) 'What you get is what you see: A contribution to an epistemology of imagination', *Systems Research,* 13 (3), pp. 215-228.

Barr, S. H., Baker, T., Markham, S. K. and Kingon, A. I. (2009) 'Bridging the Valley of Death: Lessons Learned From 14 Years of Commercialization of Technology Education', *Academy of Management Learning & Education,* 8 (3), pp. 370-388.

Basile, A. (2011) ' Networking System and Innovation Outputs: The Role of Science and Technology Parks', *International Journal of Business and Management,* 6 (5), pp. 3-14.

Batjargal, B. (2003) 'Social Capital and Entrepreneurial Performance in Russia: A Longitudinal Study', *Organization Studies,* 24 (4), pp. 535-556.

Batjargal, B. (2005) *Network Triads: Transitivity, Referral and Venture Capital Decisions in China and Russia,* The William Davidson Institute at the University of Michigan Business School Working Papers, Working Paper No. 752, Michigan: William Davidson Institute.

Batjargal, B. (2007) 'Comparative Social Capital: Networks of Entrepreneurs and Venture Capitalists in China and Russia', *Management and Organization Review,* 3 (3), pp. 397-419.

Bayer, A. (1995) 'Hugging the bear', *The Journal of Business Strategy,* 16 (4), pp. 43.

Bergek, A., Jacobsson, S., Carisson, B., Lindmark, S. and Rickne, A. (2008) 'Analyzing the functional dynamics of technological innovation systems: A scheme of analysis', *Research Policy,* 37 (3), pp. 407.

Berman, V.R., Filippov, P.S. (2010), *History of Privatisation in Russia*. [online] History of New Russia. Available at: http://ru-90.ru/node/1142 [Accessed 10 Jul. 2017].

Berrou, J. and Combarnous, F. (2012) ' The Personal Networks of Entrepreneurs in an Informal African Urban Economy: Does the 'Strength of Ties' Matter? ', *Review of Social Economy,* 70 (1), pp. 1-30.

Bessant, J. and Tidd, J. (2007) *Innovation and Enterpreneurship.* Chichester: John Wiley & Sons.

Bierly, P. E. and Hämäläinen, T. (1995) 'Organizational learning and strategy', *Scandinavian Journal of Management,* 11 (3), pp. 209-224.

Bikkulov, A.S., Bedareva, V.V., Golovatova, E.A., Mardanov, S.A., Mikhaylova, E.V., Fedenyova, A.A., Yanykina, N.O. (2016) *Monitoring of the effectiveness of innovation activities of Russian universities.* [online] RVC. Available at: https://www.rvc.ru/upload/iblock/596/universities_monitor.pdf [Accessed 22 Aug. 2017].

Bjork, J. and Magnusson, M. (2009) 'Where Do Good Innovation Ideas Come From? Exploring the Influence of Network Connectivity on Innovation Idea Quality', *Journal of Product Innovation Management,* 26 pp. 662-670.

Blaikie, N. (2008) *Approaches to Social Enquiry: Advancing Knowledge.* 2nd edn. Cambridge: Polity Press.

Blank, S. (2013) *The Four Steps to the Epiphany: Successful Strategies for Products that Win.* 2nd edn., K&S Ranch.

Borgatti, S. P. and Foster, P. C. (2003) 'The Network Paradigm in Organizational Research: A Review and Typology ', *Journal of Management,* 29 (6), pp. 991-1013.

Borovkov, A.I. (2016) *Creating the economy of the future*. [online] Center for Computer Engineering, Available at: http://fea.ru/news/6324. [Accessed 26 Aug. 2017].

Boytsova, A. (2017) *Leading universities in Russia have been reduced funding for the next three years*. [online] RBC. Available at: http://www.rbc.ru/economics/14/02/2017/58a30d9c9a79470d909216b3. [Accessed 28 Aug. 2017].

Brem, A. (2008) *The Boundaries of Innovation and Entrepreneurship: Conceptual Background and Essays on Selected Theoretical and Empirical Aspects.* Wiesbaden: Gabler.

Bryman, A. and Bell, E. (2007) *Business Research Methods.* 2nd edn. New York: Oxford University Press Inc.

Butler, B. and Purchase, S. (2004) 'Personal Networking in Russian Post Soviet Life', *Research and Practice in Human Resource Management,* 12 (1), pp. 34-60.

Butler, B. and Purchase, S. (2008) 'Use of social capital among Russian managers of a new generation', *Industrial Marketing Management,* 37 (5), pp. 531-538.

Carayannis, E. and Dubina, I. (2014) 'Thinking Beyond the Box: Game-Theoretic and Living Lab Approaches to Innovation Policy and Practice Improvement', *Journal of the Knowledge Economy,* 5 (3), pp. 427-439.

Carayannis, E., Cherepovitsyn, A. and Ilinova, A. (2016) 'Technology commercialization in entrepreneurial universities: the US and Russian experience', *The Journal of Technology Transfer,* 41 (5), pp. 1135-1147.

Carroll, A. and Peat, B. (2010) 'Back to basics: recapturing a philosophy of business and management practice', *International Journal of Management Concepts and Philosophy,* 4 (3-4), pp. 225-243.

Carroll, S. J. and Gillen, D. J. (1987) 'Are the Classical Management Functions Useful in Describing Managerial Work?', *The Academy of Management Review,* 12 (1), pp. 38-51.

Castells, M. (2000) *The Rise of the Network Society,* 2nd edn., Oxford: Blackwell.

Catlin, K. and Matthews, J. (2001) *Leading at the Speed of Growth: Journey from Entrepreneur to CEO,* 1st edn., New York: Wiley.

Charmaz, K. (2007) *Constructing Grounded Theory: A practical Guide Through Qualitative Analysis.* London: Sage Publications.

Chenhall, R., Kallunki, J. and Silvola, H. (2011) 'Exploring the Relationships between Strategy, Innovation, and Management Control Systems: The Roles of Social Networking, Organic Innovative Culture, and Formal Controls', *Journal of Management Accounting Research,* 23, pp. 99-128.

Chesbrough, H. W. (2006) *Open Innovation: The New Imperative for Creating and Profiting from Technology.,* 1st edn., Boston: Harvard Business School Press.

Chrislip, D. (2002*) The Collaborative Leadership Fieldbook - A guide for citizens and civic leaders,* San Francisco: Josey Bass.

Christensen, C. (2016) *The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail*, Massachusetts: Harvard Business Review Press.

Coleman, J. S. (1988) 'Social Capital in the Creation of Human Capital', *The American Journal of Sociology,* 94, Supplement: Organizations and Institutions: Sociological and Economic Approaches to the Analysis of Social Structure, pp. 95-120.

Collier, P. (2002) 'Social capital and poverty: a microeconomic perspective', in Grootaert, C. &van Bastelaer, T. (eds.) *The Role of Social Capital in Development: An Empirical Assessment,* Cambridge: Cambridge University Press, pp. 19-41.

Collis, J. and Hussey, R. (2003) *Business research: A practical guide for undegraduate and postgraduate students,* 2nd edn., Basingstoke: Palgrave Macmillan.

Cooke, P., Uranga M.G. and Etxebarria, G. (1997) 'Regional innovation systems: Institutional and organisational dimensions', *Research Policy,* 26 (4), pp. 475-491.

Cooke, P., Uranga, M.G. and Etxebarria, G. (1998) 'Regional systems of innovation: an evolutionary perspective', *Environment and Planning A,* 30 (9), pp. 1563-1584.

Corbin, J. and Strauss, A. C. (1998) *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory.,* 2nd edn., London: Sage Publications.

Cordero, R. (1990) 'The measurement of innovation performance in the firm: An overview', *Research Policy,* 19 (2), pp. 185-192.

Crossan, M. M. and Apaydin, M. (2010) 'A Multi-Dimensional Framework of Organizational Innovation: A Systematic Review of the Literature', *Journal of Management Studies,* 47 (6), pp. 1154-1191.

Daft, R. and Lengel, R. (1986) 'Organizational Information Requirements, Media Richness and Structural Design', *Management Science,* 32 (5), pp. 554-571.

Daft, R. L. (1978) 'A Dual-Core Model of Organizational Innovation', *The Academy of Management Journal,* 21 (2), pp. 193-210.

Damanpour, F. (1991) 'Organizational Innovation: A Meta-Analysis of Effects of Determinants and Moderators', *The Academy of Management Journal,* 34 (3), pp. 555-590.

Damanpour, F. (1996) 'Organizational Complexity and Innovation: Developing and Testing Multiple Contingency Models', *Management Science,* 42 (5), pp. 693-716.

Davidsson, P. and Honig, B. (2003) 'The role of social and human capital among nascent entrepreneurs', *Journal of Business Venturing,* 18 (3), pp. 301-331.

Davidsson, P., Delmar, F. and Wiklund, J. (2006) 'Entrepreneurship as Growth; Growth as Entrepreneurship', in Davidsson, P., Delmar, F. and Wiklund, J. (eds.) *Entrepreneurship and the Growth of Firms.* Cheltenham, UK: Edward Elgar Publisher, pp. 21-38.

Davies, A. (2014) *Innovation and Project Management.* Oxford: The Oxford Handbook of Innovation Management.

Dementiev, V.E. (2009a) ‘Struggle for the nanotechnological leadership: the USA, EU, China, Russia’, *Journal of the New Economic Association,* 3-4, pp. 123-144.

Dementiev, V.E. (2009b) ‘Overtaking development through the prism of the theory of "long-wave" technological dynamics: the aspect of "windows of opportunities" in crisis conditions’, *Journal of Russian Economics*, 1-2, pp. 34-48.

Demidov, E.E. (2009) *Economics of a project organization.* [online] Corporate Management. Available at: http://www.cfin.ru/management/practice/project_org_economy.shtml [Accessed 26 Jul. 2017].

Dequech, D. (2003) 'Cognitive and Cultural Embeddedness: Combining Institutional Economics and Economic Sociology', *Journal of Economic Issues,* 37 (2), pp. 461-470.

Deschamps, J. (1995) *Managing Innovation: From Serendipity to Process*. [online] Arthur D. Little. Available at: http://www.adlittle.se/uploads/tx_extprism/1995_q2_13-22.pdf [Accessed 10 Mar. 2017].

Dezhina I., Etzkowitz H. (2016) ‘Path dependence and novelties in Russian innovation’, *Triple Helix*, 3(11), pp. 2-10.

Dezhina, I. (2016) ‘Innovation policy in Russia: development, challenges and prospects’, *Note from the Observatoire Franco-Russe*, 12, pp. 34-42

Dezhina, I. G., Kiseleva, V.V. (2008) *State, Science and Business in the Innovation System of Russia*. Moscow: Institute for Economic Policy named after E.T. Gaidar.

Diveeva, J. (2015) *Putin approved a new National Security Strategy*. [online] Komsomolskaya Pravda, Available at: 12/31/2015, https://www.kp.ru/online/news/2267039/ [Accessed 26 Aug. 2017].

Djankov, S., Qian, Y., Roland, G. and Zhuravskaya, E. (2006) 'Entrepreneurship in China and Russia Compared', *Journal of the European Economic Association,* 4 (2), pp. 352-365.

Dobrov, G.M. (1970) *The organisation of science*. Kiev: Naukova Dumka

Dodgson, M., Gann, D. M. and Phillips, N. (2014) *The Oxford Handbook of Innovation Management.* Kindle Edition. Oxford: Oxford University Press.

Doloreux, D. and Parto, S. (2005) 'Regional innovation systems: Current discourse and unresolved issues', *Technology in Society,* 27 (2), pp. 133-153.

Drazin, R. and Schoonhoven, C. B. (1996) 'Community, Population, and Organization Effects on Innovation: A Multilevel Perspective', *The Academy of Management Journal,* 39 (5), pp. 1065-1083.

DuBrin, A.J. (2010) *Essentials of Management,* 9th edn., Boston: Cengage Learning.

Dundon, E. (2002) *The Seeds of Innovation: Cultivating the Synergy That Fosters New Ideas.* 2nd edn. New York: AMACOM.

Dyer, J.H. and Chu, W. (2003) 'The Role of Trustworthiness in Reducing Transaction Costs and Improving Performance: Empirical Evidence from the United States, Japan, and Korea', *Organization Science,* 14 (1), pp. 57-68.

Ebbinghaus, B. (2005) *Can Path Dependence Explain Institutional Change? Two Approaches Applied to Welfare State Reform*, MPIfG Discussion Paper No. 05/2, Köln: Max-Planck-Institut für Gesellschaftsforschung.

Edmondson, A. C. (2012) *Teaming: How Organizations Learn, Innovate, and Compete in the Knowledge Economy*, New York: John Wiley & Sons.

Edovina, T. (2015) 'We are awaiting a radical restructuring of the main industries. Interview with Peskovov Dmitry', [online] *Kommersant*, Jan. 04, Available at: https://www.kommersant.ru/doc/2698958 [Accessed 12 Aug. 2017].

Edquist, C. (1997) *Systems of Innovation: Technologies, Institutions and Organizations.* London: Pinter Publishers.

Elfring, T. and Hulsink, W. (2003) ' Networks in Entrepreneurship: The Case of High-technology Firms', *Small Business Economics*, 21 (4), pp. 409-422.

Estrin, S., Meyer, K. E. and Bytchkova, M.(2008) 'Entrepreneurship in Transition Economies', in Casson, M. C., Yeung, B. and Basu, A. (eds.) *The Oxford Handbook of Entrepreneurship.* Oxford: Oxford University Press, pp. 693-725.

Ettlie, J. E. and Rubenstein, A. H. (1987) 'Firm size and product innovation', *Journal of Product Innovation Management*, 4 (2), pp. 89-108.

Etzkowitz, H. (2008) *University-Industry-Government Innovation in Action*. London: Routledge.

Etzkowitz, H., Ranga, M. (2013) 'Triple Helix Systems: An Analytical Framework for Innovation Policy and Practice in the Knowledge Society', *Industry and Higher Education*, 27(4), pp. 237 – 262.

Etzkowitz, H., Ranga, M., Benner, M., Guaranys, L., Maculan, A.M. and Kneller, R. (2008) 'Pathways to the entrepreneurial university: towards a global convergence', *Science and Public Policy*, 35(9), pp. 681–695.

Evan, W. M. and Black, G. (1967) 'Innovation in Business Organizations: Some Factors Associated with Success or Failure of Staff Proposals', *The Journal of Business*, 40 (4), pp. 519-530.

Fagerberg, J., Mowery, D. C. and Nelson, R. R. (2006) *The Oxford Handbook of Innovation.* Oxford: Oxford University Press.

Fernie, S., Green, S. D., Weller, S. J. and Newcombe, R. (2003) 'Knowledge sharing: context, confusion and controversy', *International Journal of Project Management*, 21 (3), pp. 177-187.

Filley, A. and Aldag, R. (1978) 'Characteristics and Measurement of an Organizational Typology', *Academy of Management Journal*, 21 (4), pp. 578-591.

Fischer, E. and Reuber, R. (2011) 'Social interaction via new social media: How can interactions on Twitter affect effectual thinking and behavior?', *Journal of Business Venturing*, 26 pp. 1-18.

Flick, U. (2009) *An introduction to qualitative research*, 4th edn., London: Sage Publications.

Frederiksen, M. H. and Knudsen, M. P. (2017) 'From Creative Ideas to Innovation Performance: The Role of Assessment Criteria', *Creativity and Innovation Management*, pp. 1-15.

Freeman, C. (1995) 'The "national system of innovation" in historical perspective', *Cambridge Journal of Economics,* 19 (1), pp. 5.

Galavan, R., Murray, J. and Markides, C. (2008) *Strategy, Innovation, and Change: Challenges for Management.* 1st edn. Oxford: Oxford University Press.

Garcia, R. and Calantone, R. (2002) 'A critical look at technological innovation typology and innovativeness terminology: a literature review', *The Journal of Product Innovation Management,* 19 pp. 110-132.

Garrick, J. (1999) 'Doubting the philosophical assumptions of interpretive research', *International Journal of Qualitative Studies in Education,* 12 (2), pp. 147-156.

Garrick, J. and Rhodes, C. (eds.) (2000) *Research and knowledge at work: Perspectives, case-studies and innovative strategies.* London: Routledge.

Gartner, W. B. (1990) 'What are we talking about when we talk about entrepreneurship?', *Journal of Business Venturing,* 5 (1), pp. 15-28.

Gemünden, H. G., Killen, C. and Kock, A. (2013) ' A Special Issue of Creativity and Innovation Management: Implementing and Informing Innovation Strategies through Project Portfolio Management ', *Creativity and Innovation Management,* 22 (1), pp. 103-104.

Gemünden, H. G., Ritter, T. and Heydebreck, P. (1996) 'Network configuration and innovation success: An empirical analysis in German high-tech industries', *International Journal of Research in Marketing,* 13 (5), pp. 449-462.

Gerhardt, U. (1994) 'The use of weberian ideal-type methodology in qualitative data interpretation: an outline for ideal-type analysis', *Bulletin De Méthodologie Sociologique,* 45, pp. 74-126.

Ghauri, P. and Gronhaug, K. (2005) *Research Methods in Business Studies: A Practical Guide.,* 3rd edn., Harlow, Essex: Pearson Education Limited.

Gillespie, N. A. and Mann, L. (2004) 'Transformational leadership and shared values: the building blocks of trust', *Journal of Managerial Psychology,* 19 (6), pp. 588-607.

Glanville, J. L. (2016) 'Why Does Involvement in Voluntary Associations Promote Trust? Examining the Role of Network Diversity', *Sociological Inquiry,* 86 (1), pp. 29-50.

Godin, B. (2009) 'National Innovation System: The System Approach in Historical Perspective', *Science, Technology & Human Values,* 34 (4), pp. 476-501.

Gokhberg, L.M. (2017) *Russian Regional Innovational Development Ranking*, 5th edn., Moscow: National Research University "Higher School of Economics".

Gokhberg, L., Kuznetsova, T. (2016) ‘UNESCO Science Report: towards 2030’, Paris: Unesco Publishing, pp. 343-363.

Golichenko, O. (2011) *Key Factors in the Development of the National Innovation System: Lessons for Russia*. Moscow: Nauka.

Golubtsov, V.G., Tyulkin, A.A., Syatchikhin, A.V. et al. (2013) *Problems of scientific, technological and innovation policy in Russia*. St. Louis: Science & Innovation Center

Goncharova, O. (2016) ‘Those who survived in the criminal wars of the 90s, started being engaged in business in Kaliningrad and became state officials: Interview with Egorov N., ex-head of the Kaliningrad Office for Combating Organised Crime’, [online] Internet portal klops.ru, Available at: https: //klops.ru/interview/intervyu/143220-te-kto-vyzhil-v-kriminalnyh-voynah-90-h-zanimayutsya-biznesom-v-kaliningrade-poshli-vo-vlast [Accessed 25 Jul. 2017].

Goremykina, E. (2009) *The new law "On the development of small and medium enterprises in the Russian Federation" with regard to the relations in the sphere of innovations*. [online] All-Russian information-analytical portal of Venture Russia. Available at: http://www.allventure.ru/articles/43/#replies_page1 [Accessed 14 Aug. 2017].

Gorodnikova, N.V., Gokhberg, L.M., Ditkovsky, K.A. (2017) *Indicators of innovation activity: 2017: Statistical Digest*, Moscow: HSE.

Gorovtsova, M. (2013) *Insurance premiums for individual entrepreneurs: reboot*. [online] GARANT.RU, Available at: http://www.garant.ru/article/487499/ [Accessed 22 Aug. 2017].

Goulding, C. (2005) *Grounded Theory: A Practical Guide for Management, Business and Market Researches.*, 2nd edn., London: Sage Publishing.

Graham, J. (2000) ' Avoiding the killer curve ', *Agency Sales*, 30 (9), pp. 54-55.

Granovetter, M. (1973) 'The Strength of Weak Ties', *American Journal of Sociology*, 78 (1360), pp. 1380.

Greco, J. and Sosa, E. (eds.) (1999) *The Blackwell Guide to Epistemology.*, 4th edn., Oxford: Wiley-Blackwell.

Greve, A. and Salaff, J. W. (2003) 'Social Networks and Entrepreneurship', *Entrepreneurship Theory and Practice*, 28 (1), pp. 1-22.

Grishin, N. (2014) 'Adventures of a grant-eater', [online] *Kommersant*, Available at: https://www.kommersant.ru/doc/2383659 (Accessed: 26 Aug. 2017).

Gruber, T. (1995) 'Toward Principles for the Design of Ontologies Used for Knowledge Sharing', *International Journal Human-Computer Studies*, 43 (5-6), pp. 907-928.

Gudkov, L. (2012) 'Trust in Russia: Meaning, Functions, Structure', *Public Opinion Bulletin*, 2 (112), pp. 8-47.

Gusev, A. (2016) *A science city: a forgotten genre or a renaissance?* [online] The Country's Capital: Federal Internet Service Edition. Apr. 26, Available at: http://kapital-rus.ru/articles/article/naukograd y_zabytyi_janr_ili_renessans/ [Accessed 26 Jul. 2017].

Gusev, V.V., Guseva Y.V. (2016) ‘Innovative entrepreneurship as economy driver of the future: outlines of new policies in innovative development managemen’, *Voprosy Upravleniya*, Ural Institute of Management, 4 (38), pp. 45-49.

Gutterman, A.S. (2012) *Definitions of Entrepreneurship* [online] Available at: http://alangutterman.typepad [Accessed 12 Jul. 2018]

Hallikas, J., Karvonen, I., Pulkkinen, U., Virolainen, V. and Tuominen, M. (2004) 'Risk management processes in supplier networks', *International Journal of Production Economics,* 90 (1), pp. 47-58.

Hallikas, J., Virolainen, V. and Tuominen, M. (2002) 'Risk analysis and assessment in network environments: A dyadic case study', *International Journal of Production Economics,* 78 (1), pp. 45-55.

Hämäläinen, T. J. and Heiskala, R. (2007) *Social Innovations, Institutional Change and Economic Performance: Making Sense of Structural Adjustment Processes in Industrial Sectors, Regions and Societies.* Cornwall: Edwar Elgar in association with Sitra, the Finnish Innovation Fund.

Hämäläinen, T. J. and Schienstock, G. (2001) 'The comparative advantage of networks in economic organisation: Efficiency and innovation in highly specialised and uncertain environments', in OECD (ed.) *Innovative Networks. Co-operation in National Innovation Systems.* Paris: OECD Publishing, pp. 17-45.

Hanks, S. H., Watson, C. J., Jansen, E. and Chandler, G. N. (1993) 'Tightening the life-cycle construct: a taxonomic study of growth stage configurations in high-technology organizations', *Entrepreneurship: Theory and Practice,* 18 (2), pp. 5-30.

Heertje, A. (2006) *Schumpeter on the Economics of Innovation And the Development of Capitalism.* Cheltenham: Edward Elgar Pub.

Henderson, R. M. and Clark, K. B. (1990) ' Architectural Innovation: The Reconfiguration of Existing Product Technologies and the Failure of Established Firms ', *Administrative Science Quarterly,* 35 (1), pp. 9-30.

Hessels, J. (2008) 'International Entrepreneurship: An Introduction, Framework and Research Agenda', *IDEAS Working Paper Series from RePEc*.

Hillman, K., Nilsson, M., Rickne, A. and Magnusson, T. (2011) 'Fostering sustainable technologies: a framework for analysing the governance of innovation systems', *Science and Public Policy,* 38 (5), pp. 403-415.

Hinssen, P. (2015) *The network always win: hoe to influence customers, stay relevant, and transform your organization to move faster than the market.* New York: McGraw-Hill Education.

Hisrich, R. D. (1990) ' Entrepreneurship/Intrapreneurship ', *American Psychologist,* 45 (2), pp. 209-222.

Hite, J. M. and Hesterly, W. S. (2001) ' The evolution of firm networks: from emergence to early growth of the firm ', *Strategic Management Journal,* 22 (3), pp. 275-286.

Hoang, H. and Antoncic, B. (2003) 'Network-based research in entrepreneurship: A critical review', *Journal of Business Venturing,* 18 (2), pp. 165-187.

Holahan, P. J., Sullivan, Z. Z. and Markham, S. K. (2014) ' Product Development as Core Competence: How Formal Product Development Practices Differ for Radical, More Innovative, and Incremental Product Innovations ', *Journal of Product Innovation Management,* 31 (2), pp. 329-345.

Hollen, R. M. A., Van Den Bosch, Frans A.J. and Volberda, H. W. (2013) 'The Role of Management Innovation in Enabling Technological Process Innovation: An Inter-Organizational Perspective', *European Management Review,* 10 pp. 35-50.

Horak, S., Afiouni, F., Bian, Y., Ledeneva, A., Muratbekova-Touron, M. and Fey, C. (2018) 'Management and Organization Review Special Issue 'Social Networks – The Dark and Bright Sides of Informal Networks'', *Management and Organization Review,* 14 (2), pp. 439-444.

Hunter, J. G. (2003) 'Determinants of business success under "hypocapitalism": Case studies of Russian firms and their strategies', *Journal of Business Research,* 56 (2), pp. 113-120.

Innovation.gov.ru (2016) *Support for private high-tech leader companies*. [online] Innovation.gov.ru. Available at: http://innovation.gov.ru/en/node/73428 [Accessed 22 Aug. 2017].

Innovation.gov.ru (2016) *Technological platforms.* [online] Innovations in Russia. Available at: http://innovation.gov.ru/ru/taxonomy/term/2331 [Accessed 26 Aug. 2017].

Ionescu, L. (2011) 'Contemporary Economic Crime and Corruption in Russia', *Economics, Management and Financial Markets,* 6 (2), pp. 137-142.

IPP (2016) *Russian Federation's STI Outlook 2016*. [online] The Innovation Policy Platform. Available at: https://www.innovationpolicyplatform.org/content/russian-federation. [Accessed 16 Aug. 2017].

Isaksen, A. (2001) '*Building Regional Innovation Systems:Is Endogenous Industrial DevelopmentPossible in the Global Economy?*', *Canadian Journal of Regional Science,* XXIV (1), pp. 101-120.

Isaksen, A. and Nilsson, M. (2011) *Linking scientific and practical knowledge in innovation systems.* IDEAS Working Paper Series from RePEc. Working paper no. 2011/12, Lund: Centre for Innovation, Research and Competence in the Learning Economy (CIRCLE) at Lund University.

Isaksen, A. and Nilsson, M. (2013) 'Combined Innovation Policy: Linking Scientific and Practical Knowledge in Innovation Systems', *European Planning Studies,* 21 (12), pp. 1919-1936.

Jack, S., Moult, S., Anderson, A. and Dodd, S. (2010) ' An entrepreneurial network evolving: Patterns of change ', *International Small Business Journal*, 28 (4), pp. 315-337.

Johannessen, J., Olsen, B. and Lumpkin, G. T. (2001) 'Innovation as newness: what is new, how new, and new to whom?', *European Journal of Innovation Management,* 4 (1), pp. 20-31.

Johnson, M.S. (2008). Historical Legacies of Soviet Higher Education and the Transformation of Higher Education Systems In Postsoviet Russia and Eurasia. In: D. Baker and A. Wiseman, ed., *Worldwide Transformation of Higher Education*. Bradford: Emerald Group Publishing Limited.

Johnson, S. (2011) *Where Good Ideas Come From: The Seven Patterns of Innovation.* London: Penguin.

Jumpponen, J. and Pihkala, T. (2008) *Entrepreneurial Decision-making in Russia - Strategic Management in Hostile Business Environment?* Halifax, Nova Scotia, Canada. Washington: International Council for Small Business (ICSB).

Kalabekov, I.G. (2017) *Russian reforms in figures and facts (reference edition).* [online] Moscow: RUSAKI. Available at: http://refru.ru/ [Accessed 11 Jul. 2017].

Kalinov V. (2011) Scientific and Technical Potential of the USSR in the Years of Perestroika: Controversial Problems, Vlast, No. 12, pp. 177-179

Kapsali, M. (2011) 'Systems thinking in innovation project management: A match that works', *International Journal of Project Management,* 29 (4), pp. 396-407.

Kara-Murza, S.G. (2013) 'Reform of Russian Science in the 1990s', *Scientific Expert*, 5, pp. 5-46.

Kara-Murza, S.G., Kuropatkina, O.V., Vershinin, A.A. (2014) *Vicious Circles of Post-Soviet Russia*. M: Scientific Expert.

Karmyshkin, A. (2015). 'System update. How Russia to become an innovative leader', [online] *Kommersant Vlast*, Available at: https://www.kommersant.ru/doc/2846516 [Accessed 2 Aug. 2017].

Katrovsky, A.P., Guba, V.P. (2015) 'Higher education in Russia - the process of transformation and integration', *Bulletin of Polesie State University. Series of Social and Human Sciences*, 2, pp. 32-40

Keeley, L., Nagji, B. and Walters, H. (2013) *Ten Types of Innovation : The Discipline of Building Breakthroughs.* New York: Wiley.

Kharchilava, K. (2014) 'Trust as a Key Element of the System of Values of Corporate Governance', *University Bulletin (State University of Management, Russia),* 5, pp. 179-182.

Kim, Y. and Lui, S. S. (2015) ' The impacts of external network and business group on innovation: Do the types of innovation matter? , September 2015, 68(9), pp. 1964-1973 [Peer Reviewed Journal] ', *Journal of Business Research,* 68 (9), pp. 1964-1973.

Kireev, M. (2010) *Exodus of the scientists*, [online] Der Spiegel. Available at: https://www.inopressa.ru/article/08oct2010/spiegel/science.html [Accessed 11 Jul. 2017].

Kiseleva, M. (2017) *Many young researchers will not be retained in science, Interview with Gokhberg L., The first Pro-rector, Director of the Institute for Statistical Studies and Economics of Knowledge*. [online] ISSEK, High School of Economics. Available at: https://issek.hse.ru/press/205309841.html [Accessed 28 Aug. 2017].

Kogut, B. and Zander, U. (1996) 'What Firms Do? Coordination, Identity, and Learning', *Organization Science,* 7 (5), pp. 502-518.

Kolesov, A. (2017) 'How the Information Technology Development Fund will work', [online] *PC Week*, 2 (923), Available at: 14 https://www.itweek.ru/gover/article/detail.php?ID=191987 [Accessed 18 Aug. 2017].

Komarova, Y. (2016) *Is there life after the Mega-grant? Interview with Stanislav Smirnov*. [online] Indicator.Ru. Available at: https://indicator.ru/article/2016/11/06/est-li-zhizn-posle-megagranta/. [Accessed 16 Aug. 2017].

Kommersant (2017) *Moscow at the forum "Smart Cities-2017" in Barcelona: "smart" achievements and future plans.* [online] Available at: https://www.kommersant.ru/doc/3461642 (Accessed: 23 May 2018).

Krivobok, R. (2011) *The 1998 default in Russia: causes, chronology, consequences.* [online] Moscow: RIA-Novosti, Aug. 24, Available at: https://ria.ru/history_spravki/20110824/422807796.html [Accessed 14 Jul. 2017].

Kucharska, W. (2017) 'Relationships between Trust and Collaborative Culture in the Context of Tacit Knowledge Sharing', *Journal of Entrepreneurship, Management and Innovation,* 4 (13), pp. 61-78.

Kumpen, D.A. (2008) 'Normative and legal regulation of management education in HEIs of physical culture', *Uchenye zapiski universiteta named after Lesgaft P.F.*, 11 (45), pp. 45-48

Kushch, Sergey P. (2007) *Methodology of Management of Inter-Firm Relations in Industrial Markets.* Doctor of Economic Sciences. Graduate School of Management, St. Petersburg State University.

Kuzminov, Y.I., Semenov, D.S., Frumin, I.D. (2013) 'Structure of the university network: from the Soviet to the Russian "master plan"', [online], *Voprosy obrazovania,* 4, pp. 10-69. Available at: https://vo.hse.ru/data/2014/08/04/1314336015/2013-4_Kuzminov.pdf [Accessed 24 Jul. 2017].

Kuznetsov, E. (2016) *National Report on Innovations In Russia-2016*. [online] RVC. Available at: http://www.rvc.ru/en/analytics/ [Accessed 22 Aug. 2017].

Kvist, J. (2007) 'Fuzzy set ideal type analysis', *Journal of Business Research,* 60 (5), pp. 474-481.

Laranja, M. (2012) ' Network governance of innovation policies: The Technological Plan in Portugal ', *Science and Public Policy,* 39 (5), pp. 655-668.

Larson, A. and Starr, J. A. (1993) 'A network model of organization formation', *Entrepreneurship: Theory and Practice,* 17 (2), pp. 5-15.

Ledeneva, A. (1998) *Russia's economy of favours: Blat, networking and informal exchange.* Cambridge: Cambridge University Press.

Ledeneva, A. (2008) 'Blat and Guanxi: Informal Practices in Russia and China', *Comparative Studies in Society and History,* 50 (1), pp. 118-144.

Ledeneva, A. (2009) 'From Russia with Blat: Can Informal Networks Help Modernize Russia?', *Social Research,* 76 (1), pp. 257-288.

Lerner, J., Leamon, A. and Hardymon, F. (2012) *Venture Capital, Private Equity, and the Financing of Entrepreneurship.* 1st edn. New York: John Wiley & Sons.

Lewins, A. and Silver, C. (2007) *Using Software in Qualitative Research: a Step-by-Step Guide.* London: Sage Publications.

Liao, S. and Wu, C. (2010) 'System perspective of knowledge management, organizational learning, and organizational innovation', *Expert Systems with Applications,* 37 (2), pp. 1096-1103.

Liao, S., Fei, W. and Liu, C. (2008) 'Relationships between knowledge inertia, organizational learning and organization innovation', *Technovation,* 28 (4), pp. 183-195.

Lichinsky, G. (2017) 'Russian scientists are more often published in prestigious scientific journals nowadays', [online] *Kommersat.ru*, Available at: Sep. 01, https://www.kommersant.ru/doc/3398296 [Accessed 22 Aug. 2017].

Luchsinger, V. and Bagby, D. R. (1987) 'Entrepreneurship and Intrapreneurship: Behaviors, Comparisons, and Contrasts', *S.A.M. Advanced Management Journal,* 52(3) pp. 10-13.

Lundvall, B. (1992) *National Systems of Innovation. Towards a Theory of Innovation and Interactive Learning.* London: Pinter Publishers.

Mahoney, J. (2000) 'Path Dependence in Historical Sociology', *Theory and Society,* 29 (4), pp. 507-548.

Maier, V. and Pop Zenovia, C. (2011) 'Entrepreneurship versus Intrapreneurship', 12 (5), pp. 971-976.

Markham, S. K., Ward, S. J., Aiman-Smith, L. and Kingon, A. I. (2010) 'The Valley of Death as Context for Role Theory in Product Innovation ', *Journal of Product Innovation Management,* 27 (3), pp. 402-417.

Marshall, C. and Rossman, G. B. (2011) *Designing Qualitative Research.,* 5th edn., Thousand Oaks: Sage Publications.

Martin, P. Y. and Turner, B. A. (1986) 'Grounded theory and organizational research', *The Journal of Applied Behavioral Science,* 22 (2), pp. 141-157.

Martinez, M. A. and Aldrich, H. E. (2011) ' Networking strategies for entrepreneurs: balancing cohesion and diversity ', *International Journal of Entrepreneurial Behaviour & Research,* 17 (1), pp. 7-38.

Maurya, A. (2012) *Running Lean.* 2nd edn. Sebastopol: O'Reilly Media.

McFadzean, E., O'Loughlin, A. and Shaw, E. (2005) 'Corporate entrepreneurship and innovation part 1: the missing link', *European Journal of Innovation Management,* 8 (3), pp. 350-372.

Medovnikov, D. (2017) *Transfer of technology, not people*. [online] The Journal of Innovations in Russia "Stimulus". Available at: https://stimul.online/articles/sreda/transfer-ne-tekhnologiy-a-lyudey/ [Accessed 22 Aug. 2017].

Meduza (2015) *How in Russia did the market economy appear: Russian business from the point of view of science*. [online] Meduza. Available at: https://meduza.io/feature/2016/05/23/kak-v-rossii-poyavilas-rynochnaya-ekonomika [Accessed 21 Jul. 2017].

Medvedev, D.A. (2009a) 'Russia, strive forward!', *Gazeta.ru*, Sept. 10

Medvedev, D.A. (2009b) ‘Presidential Address to the Federal Assembly’, Nov. 12

Mega-grants (2015) *Resolution No. 128, Ministry of Education and Science of the Russian Federation*. [online] Available at: http://www.p220.ru/home/news/item/668-post128 [Accessed 16 Aug. 2017].

Metcalfe, S. (1995) 'Technology Systems and Technology Policy in an Evolutionary Framework', *Cambridge Journal of Economics*, 19, pp. 25-46.

Michailova, S. and Husted, K. (2003) 'Knowledge-Sharing Hostility in Russian Firms', *California Management Review*, 45 (3), pp. 59-77.

Michailova, S. and Worm, V. (2003) 'Personal Networking in Russia and China: Blat and Guanxi', *European Management Journal*, 21 (4), pp. 509-519.

Mikhailova, E.V. (2008) ‘Legal support of venture financing in Russia’, *Bulletin of Volgograd Business Institute*: *Business. Education. Rights*, 7, pp. 55-60.

Mincomsvyaz (2013). *Strategy of the IT industry development in the Russian Federation for 2014-2020 and for the future up to 2025, Approved by the decree of the Government of the Russian Federation of November 1, 2013 No. 2036-r.* [online] The Ministry of Telecom and Mass Communications of the Russian Federation, Available at: http://minsvyaz.ru/ru/documents/4084/#tdownloadblock [Accessed 22 Aug. 2017].

Ministry of Economic Development of Russia (2015) *State support of small and medium-sized business in 2016*. [online] Department for the Development of Small and Medium-sized Entrepreneurship and Competition. Available at: http://economy.gov.ru/ [Accessed 22 Aug. 2017].

Ministry of Economic Development of Russia (2017) *On the allocation in 2017 of subsidies for state support of small and medium-sized businesses*, [online] Department for the Development of Small and Medium-sized Entrepreneurship and Competition. Available at: http://government.ru/docs/26283/ [Accessed 22 Aug. 2017].

Mintzberg, H. (1971) 'Managerial Work: Analysis from Observation', *Management Science*, 18 (2), pp. 97-110.

Mintzberg, H. (1991) ' Learning 1, planning 0 reply to Igor Ansoff ', *Strategic Management Journal*, 12 (6), pp. 463-466.

Mitin, V. (2017) *On the Nature of the National Technological Initiative, Interview with Kovnir E.*, [online] PC Week, Available at: http://nti2035.ru/media/publication/o-sushchnosti-natsionalnoy-tekhnologicheskoy-initsiativy [Accessed 12 Aug. 2017].

Młokosiewicz, M. and Misiak-Kwit, S. (2017) 'The Impact of Trust on Entrepreneurship in Poland', *Journal of Entrepreneurship, Management and Innovation*, 4 (13), pp. 79-96.

Mol, M. J. and Birkinshaw, J. (2009) 'The sources of management innovation: When firms introduce new management practices', *Journal of Business Research*, 62 (12), pp. 1269-1280.

Mole, K., North, D. and Baldock, R. (2017) 'Which SMEs seek external support? Business characteristics, management behaviour and external influences in a contingency approach', *Environment and Planning C: Politics and Space*, 35 (3), pp. 476-499.

Morgan, G. and Smircich, L. (1980) 'The Case for Qualitative Research', *The Academy of Management Review,* 5 (4), pp. 491-500.

Morgan, K. (2004) 'The exaggerated death of geography: learning, proximity and territorial innovation systems', *Journal of Economic Geography,* 4 (1), pp. 3-21.

Morgan, K. (2007) 'The Learning Region: Institutions, Innovation and Regional Renewal', *Regional Studies,* 41 (5), pp. 147-159.

Muller, E. and Zenker, A. (2001) 'Business services as actors of knowledge transformation: the role of KIBS in regional and national innovation systems', *Research Policy,* 30 (9), pp. 1501-1516.

Musiolik, J., Markard, J. and Hekkert, M. (2012) 'Networks and network resources in technological innovation systems: Towards a conceptual framework for system building', *Technological Forecasting & Social Change,* 79 (6), pp. 1032-1048.

Myers, M. D. (2009) *Qualitative research in Business & Management.* London: Sage Publications.

NABA (2013) *Annual Survey of the Angel Investment Market*. [online] National Association of Business Angels. Available at: https://www.rvc.ru/upload/iblock/096/201312_angel_investments.pdf [Accessed 22 Aug. 2017].

NAFI (2017) *Lending to small and medium-sized businesses. Results of 2016. Review of statistics*. [online] NAFI Research Center. Available at: http://tass.ru/msp/4109623 [Accessed 16 Aug. 2017].

Nahapiet, J. and Ghoshal, S. (1998) 'Social capital, intellectual capital, and the organizational advantage', *Academy of Management Review,* 23 (2), pp. 242-266.

Nassimbeni, G. (1998) 'Network structures and co-ordination mechanisms', *International Journal of Operations & Production Management,* 18 (6), pp. 538-554.

Naude, P. and Buttle, F. (2000) 'Assessing relationship quality', *Industrial Marketing Management,* 29 (4), pp. 351-361.

Nelson, R. (1993) *National Innovation Systems: a Comparative Analysis.* Oxford: Oxford University Press.

Newell, S. and Swan, J. (2000) 'Trust and inter-organizational networking', *Human Relations,* 53 (10), pp. 1287-1327.

Newman, L. (1998) 'Analysis of qualitative data', *Sociological Research,* 12, pp. 101-114.

Nguyen, A. and Cragg, W. (2012) 'Interorganizational Favour Exchange and the Relationship Between Doing Well and Doing Good', *Journal of Business Ethics,* 105 (1), pp. 53-68.

Niosi, J., Saviotti, P., Bellon, B. and Crow, M. (1993) ' National Systems of Innovation: In Search of a Workable Concept', *Technology in Society,* 15, pp. 207-227.

Nobelius, D. (2004) 'Towards the sixth generation of R&D management', *International Journal of Project Management,* 22 (5), pp. 369-375.

Nonaka, I. (1994) ' A Dynamic Theory of Organizational Knowledge Creation ', *Organization Science*, 5 (1), pp. 14-37.

OECD (1997). *National Innovation Systems*. Paris: Organisation for Economic Co-Operation and Development.

OECD (1999) *Managing National Innovation Systems*, Paris: OECD Publishing.

OECD (2001) *Innovative Networks: Co-operation in National Innovation Systems*, Paris: OECD Publishing.

OECD (2005) *Oslo Manual: Guidelines for collecting and interpreting innovation data*. 3rd edn. Paris: Organisation for Economic Co-Operation and Development, Statistical Office Of The European Communities, Paris: OECD Publishing.

OECD (2010) *The OECD Innovation Strategy: Getting a head start on tomorrow*, Paris: OECD Publishing.

OECD (2011) *OECD Reviews of Innovation Policy: Russian Federation*, Paris: OECD Publishing.

OECD (2015) *Russian Federation: Key Issues and Policies, OECD Studies on SMEs and Entrepreneurship*. [online] Paris: OECD Publishing. Available at: http://dx.doi.org/10.1787/9789264232907-en [Accessed 16 Aug. 2017].

OECD (2017) *Public Procurement for Innovation: Good Practices and Strategies*. Paris: OECD Publishing.

Open Government (2016a) *Government reform: implementation of a project approach*. [online] Open Government. Available at: http://open.gov.ru/events/5514922/ [Accessed 22 Aug. 2017].

Open Government (2016b) *Innovative development programs for state companies will be subject to independent expert review*. [online] Open Government. Available at: *http://open.gov.ru/events/5515292/* [Accessed 12 Aug. 2017].

Open Government (2017) *Innovative development programs received an independent evaluation*. [online] Open Government. Available at: http://open.gov.ru/events/5516035/ [Accessed 12 Aug. 2017].

Oughton, C., Landabaso, M. and Morgan, K. (2002) 'The Regional Innovation Paradox: Innovation Policy and Industrial Policy', *The Journal of Technology Transfer*, 27 (1), pp. 97-110.

Overall, J. and Wise, S. (2015) 'An S-Curve Model of the Start-Up Life Cycle Through the Lens of Customer Development', *The Journal of Private Equity*, 18 (2), pp. 23-34.

Palmberg, C. (2006) 'The sources and success of innovations —Determinants of commercialisation and break-even times', *Technovation*, 26 (11), pp. 1253-1267.

Palmberg, C. and Lemola, T. (2012) 'Governance of Innovation Systems', in in *Agricultural Innovation Systems. an Investment Sourcebook*, Washington: International Bank for Reconstruction and Development, pp. 469-479.

Park, Y., Yoon, B. and Lee, S. (2005) 'The idiosyncrasy and dynamism of technological innovation across industries: patent citation analysis', *Technology in Society,* 27 (4), pp. 471-485.

Parker, S. C. (2011) 'Intrapreneurship or entrepreneurship?', *Journal of Business Venturing,* 26 (1), pp. 19-34.

Paschen, J. (2016) 'Choose wisely: Crowdfunding through the stages of the startup life cycle', *Business Horizons,* Kelley School of Business, Indiana University pp. 1-10.

Pavett, C. M. and Lau, A. W. (1983) 'Managerial Work: The Influence of Hierarchical Level and Functional Specialty', *The Academy of Management Journal,* 26 (1), pp. 170.

Pavlov, E. (2013) 'Technoparks are an important element of modern innovative economy', *Smart Production*, 5(23), pp. 3-9.

Petrovsky, A.B., Semenov, L.K., Malov, V.S. (1990) *Academy staff: composition, structure, dynamics.* [online] Institute for the History of Science and Technology of the Russian Academy of Sciences. Available at: http://www.ihst.ru/projects/sohist/papers/vran/1990/11/37-49.pdf [Accessed 26 Jul. 2017].

Pittaway, L., Robertson, M., Munir, K., Denyer, D. and Neely, A. (2004a) 'Networking and innovation: a systematic review of the evidence', *International Journal of Management Reviews,* 56 (384), pp. 137-168.

Pittaway, L., Robertson, M., Munir, K., Denyer, D. and Neely, A. (2004b) *Networking and innovation in the UK: A Systematic Review of the Literature.* Advanced Institute of Management Research.

Plieva, Z. R. (2017) 'Innovation Infrastructure of Moscow in the Information System "The National Centre For Monitoring of The Innovation Infrastructure of Scientific and Technological Activities and Regional Innovation Systems"', *Innovation and Expertise,* 1 (19), pp. 14-27.

Pluye, P., Gagnon, M., Griffiths, F. and Johnson-Lafleur, J. (2009) 'A scoring system for appraising mixed methods research, and concomitantly appraising qualitative, quantitative and mixed methods primary studies in Mixed Studies Reviews', *International Journal of Nursing Studies,* 46 (4), pp. 529-546.

Powell, W. W. (1990) 'Neither market nor hierarchy: network forms of organization', *Reserach in Organisational Behaviour,* 12 pp. 295-336.

Powell, W. W. and Grodal, S.(2006) 'Networks of innovators', in Fagerberg, J., et al (eds.) *The Oxford Handbook of Innovation (Oxford Handbooks)* . New York: Oxford University Press, pp. 56-85.

Powell, W. W. and Snellman, K. (2004) 'The Knowledge Economy ', *Annual Review of Sociology,* 30 pp. 199-220.

Presidential Decree N426 of 27.04.1992 *On Urgent Measures to Preserve the Scientific and Technical Potential of the Russian Federation*. Moscow.

Preston, P. and Cawley, A. (2004) 'Understanding the 'Knowledge Economy' in the early 21st century: Lessons from Innovation in the Media Sector', *Communications and Strategies,* 55, pp. 119-144.

Prokopenko, A., Bazanova, E. (2016) ‘The development strategy of Russia until 2030 will be the main topic of the forum in Krasnoyarsk’, [online] *Vedomosti*, Feb. 17, Available at: https://www.vedomosti.ru/economics/articles/2016/02/17/630108-strategiya-2030-stanet-temoi-foruma-v-krasnoyarske [Accessed 14 Aug. 2017].

Pukhov, S. (2014) ‘What will stop the large-scale flight of capital?’, *Comments on the state and business*, Higher School of Economics, 67, pp. 14-16.

Puschmann, T. and Alt, R. (2016) ' Sharing Economy', *Business & Information Systems Engineering*, 58 (1), pp. 93-99.

Pushkash, A. (2016) *Where we go with STI: the co-author of the project Dmitry Peskov talks about his prospects*. [online] ITMO News. Available at: http://news.ifmo.ru/ru/startups_and_business/initiative/news/5739/ [Accessed 18 Aug. 2017].

PwC, RVC (2014) *MoneyTree Venture Capital Market Navigator. Overview of Russian venture capital deals in 2013*. [online] PwC, RVC. Available at: http://www.pwc.ru/en/publications/assets/MoneyTree-2013-eng.pdf [Accessed 22 Aug. 2017].

Radosevic, S. (2002) 'Regional Innovation Systems in Central and Eastern Europe: Determinants, Organizers and Alignments', *The Journal of Technology Transfer*, 27 (1), pp. 87-96.

Raduan, C. R., Jegak, U., Haslinda, A. and Alimin, I. I. (2009) 'Management, Strategic Management Theories and the Linkage with Organizational Competitive Advantage from the Resource-Based View', *European Journal of Social Sciences*, 11 (3), pp. 402-417.

Ragozina, M.A. (2007) ‘Evaluation of the current state of the fixed assets in the industry’, [online] *The Bulletin of the Siberian Aerospace Academy named after Academician M.F. Reshetnev, Krasnoyarsk*, 2(15), p. 122-126. Available at: https://cyberleninka.ru/article/v/otsenka-sovremennogo-sostoyaniya-osnovnyh-sredstv-v-promyshlennosti [Accessed 12 Jul. 2017].

Rashidov, O. (2012) *Skolkovo: coercion to a miracle. The real story of creating the most ambitious project in the new Russia*. Moscow: Mann, Ivanov, Ferber.

RCSME (2016) *SME Statistics.* [online] Resource Center of SMEs. Available at: http://rcsme.ru/ru/statistics [Accessed 12 Aug. 2017].

Reddi, K. and Gerard, G. (2012) ' Friends, family, or fools: Entrepreneur experience and its implications for equity distribution and resource mobilization ', *Journal of Business Venturing*, 27 (5), pp. 525-543.

RG (2010) ‘Resolution of the Government of the Russian Federation of April 9, 2010 No. 219 Moscow "On State Support for the Development of Innovative Infrastructure in Federal Educational Institutions of Higher Professional Education"’, *Rossiyskaya Gazeta* - Federal Issue No. 5160 (81), Apr. 16

Richmond, Y. (2003) *From Nyet to Da: Understanding the Russians*, 3rd edn., Yarmouth, ME: Intercultural Press Inc.

Ries, E. (2011) *The Lean Startup: How Constant Innovation Creates Radically Successful Businesses.* Kindle Edition edn. London: Penguin Books.

RIPC (1991) *National Economy of the Russian Soviet Federative Socialist Republic in 1990: Statistical Yearbook.* Moscow: Republican Information and Publishing Centre

Ritala, P. (2013) 'Linking the unlinked: knowledge-based perspective on non-routine change', *Management Decision,* 51 (6), pp. 1176-1189.

Ritchie, J. and Lewis, J. (eds.) (2006) *Qualitative Research Practice: A Guide for Social Science Students and Researchers,* 1st edn., London: Sage Publications Ltd.

Ritter, T. and Gemünden, H. G. (2003) 'Network competence: Its impact on innovation success and its antecedents', *Journal of Business Research,* 56 (9), pp. 745-755.

Ritter, T. and Gemünden, H. G. (2004) 'The impact of a company's business strategy on its technological competence, network competence and innovation success', *Journal of Business Research,* 57 (5), pp. 548-556.

Roberts, E. B. (2007) ' Managing invention and innovation: technological innovation can alter the competitive status of firms and nations but its purposeful management is complex, involving the effective integration of people, organizational processes and plans ', *Research-Technology Management,* 50 (1), pp. 35-54.

Rogers, E. M. (1983) *Diffusion of Innovations.* 3rd edn. London: Collier Macmillan.

Rogulin, D. (2016) *Media: the budget for scientific research for 2017 does not correspond to the tasks of the Russian Academy of Sciences: Expenditures for scientific research in Russia have been curtailed for the fourth consecutive year*. [online] TASS. Available at: http://tass.ru/nauka/3892685 [Accessed 18 Aug. 2017].

Rokeach, M. (1973) *The Nature of Human Values.* New York: The Free Press.

Rosimushchestvo (2017) Methodological materials on the development and adjustment of innovative development programs for joint stock companies with state participation, state corporations, state companies and federal state unitary enterprises. [online] The Federal Agency for State Property Management. Available at: *https://www.rosim.ru/documents/282890 [Accessed* 20 Aug. 2017].

Rosstat (2015) *Small and medium-sized business in Russia 2015: Statistical compilation,* Moscow: Federal State Statistics Service.

Rothwell, R. (1992) 'Successful industrial innovation: critical factors for the 1990s', *R&D Management,* 22 (3), pp. 221-240.

Rothwell, R. (1994) 'Towards the Fifth-generation Innovation Process', *International Marketing Review,* 11 (1), pp. 7-31.

Rudenko, B. (2011) 'Mega-grants for Migrants', [online] *Science and Life*, 10, pp. 2-6 Available at: https://www.nkj.ru/archive/articles/20013/. [Accessed 16 Aug. 2017].

RUSSEZ (2017) *Russia. Special Economic Zones.* [online] RUSSEZ. Available at: http://www.russez.ru/ [Accessed 22 Jul. 2017].

RVC (2016*) Annual Report: forming new instruments*. [online] Russian Venture Company. Available at: http://www.rvc.ru/upload/iblock/150/Report_RVC_2016.pdf. [Accessed 20 Aug. 2017].

RVC (2018) *Annual report of JSC "Russian Venture Company": We create prospects.* Moscow: RVC.

RVC and HSE (2017) *Methodical recommendations for improving the efficiency of business incubators and accelerators*. [online] Russian Venture Company and Business Incubator of High School of Economics. Available at: http://www.rvc.ru/upload/iblock/c5e/guidelines.pdf. [Accessed 18 Aug. 2017].

RVCA (2009) *The review of the market of direct and venture investments for 2008*. St. Petersburg: Phoenix. [Accessed 14 Aug. 2017].

RVCA (2013) *Market Overview. Direct and venture investments in Russia 2013*. [online] Russian Venture Capital Association. Available at: http://www.rvca.ru/rus/resource/library/rvca-yearbook/ [Accessed 26 Aug. 2017].

Ryan, G. W. and Bernard, H. R. (2003) 'Techniques to Identify Themes', *Field Methods,* 15 (1), pp. 85-109.

Ryndin, I. (2013) *Finalist BIT-2013: An important stage of the accelerator was the participation of mentors.* [online] RIA Novosti & Russia Today. Available at: https://ria.ru/generation_s_interview/20131028/973176610.html [Accessed 26 Aug. 2017].

Sæte, L., Verspagen, B. and ter Weel, B. (2009) *Systems of Innovation.* United Nations University Working Paper Series. Working Paper no 062, The Netherlands: United Nations University - Maastricht Economic and social Research and training centre on Innovation and Technology.

Sæther, B., Isaksen, A. and Karlsen, A. (2011) 'Innovation by co-evolution in natural resource industries: The Norwegian experience', *Geoforum,* 42 (3), pp. 373-381.

Saunders, M., Lewis, P. and Thornhill, A. (2007) *Research Methods for Business Students.* 4th edn. Harlow: Pearson Education Limited.

Schepot'ev, A.V., Safronova, E.G. (2008) *Commentary to the Federal Law of July 24, 2007 n 209-FZ "On the development of small and medium-sized business in the Russian Federation"*. [online] Justicinform. Available at: https://www.lawmix.ru/commlaw/586 [Accessed 14 Aug. 2017].

Schienstock, G. and Hämäläinen, T. J. (2001) *Transformation of the Finnish innovation system: A network approach.* Helsinki: Hakapaino Oy.

Schoen, J., Mason, T. W., Kline, W. A. and Bunch, R. M. (2005) 'The Innovation Cycle: A NewModel and Case Study for the Invention to Innovation Process', *Engineering Management Journal,* 17 (3), pp. 3-10.

Schumpeter, J. A. (2004) *The theory of economic development.* 10th edn. New Brunswick: Transaction Publishers.

Scott, M. and Bruce, R. (1987) 'Five Stages of Growth in Small Business', *Long Range Planning,* 20 (3), pp. 45-52.

Scott, W. R. (1995) *Institutions and Organizations: Ideas and Interests.* Los Angeles: Sage Publications.

Semenov, E.V. (2007) ‘Grants in Russian Science: the Experience of the Russian Humanitarian Scientific Foundation’, [online] Moscow: Russian Research Institute of Economics, 3, p. 227-252 Available at: https://cyberleninka.ru/article/v/granty-v-rossiyskoy-nauke-opyt-rossiyskogo-gumanitarnogo-nauchnogo-fonda [Accessed 16 Jul. 2017].

Semenova, A. (2016) ‘A lonely woman wants to legalize‘[online] Moscow: Gazeta.ru, Oct. 10, Available at: https://www.gazeta.ru/social/2016/10/10/10240362.shtml [Accessed 20 Jul. 2017].

Sergeev, M. (2006) *The state investment fund of technologies and innovations can appear already this year*. Politkom.RU. Available at: http://politcom.ru/2288.html [Accessed 19 Jul. 2017].

Shapiro, C. and Varian, H. R. (1999) *Information rules: a strategic guide to the network economy.* Boston: Harvard Business School.

Sharif, N. (2006) 'Emergence and development of the National Innovation Systems concept', *Research Policy,* 35 (5), pp. 745-766.

Shatina, Y. (2016) *Primorye is ready to execute the government's instructions for project management approach implementation*. [online] Primorsky Region Administration. Available at: http://www.primorsky.ru/news/119599/ [Accessed 26 Aug. 2017].

Shaw, E., O'Loughlin, A. and McFadzean, E. (2005) 'Corporate entrepreneurship and innovation part 2: a role- and process-based approach', *European Journal of Innovation Management,* 8 (4), pp. 393-408.

Shenhar, A. J. and Dvir, D. (2007) *Reinventing Project Management: The Diamond Approach to Successful Growth and Innovation.* Harvard Business Press: Boston.

Shenin, S.Y. (2008) ‘Russian project of Harvard: from triumph to disgrace’, *Izvestiya of the Saratov University, Series: History. International relations,* 8 (2), pp. 27-33.

Shirokova, G. and McDougall-Covin, P. (2012) 'The role of social networks and institutions in the internationalization of Russian entrepreneurial firms: Do they matter?', *Journal of International Entrepreneurship,* 10 (3), pp. 177-199.

Shpilenko, A. (2016) *About clusters and technoparks and where the "Silk Road" can lead* [online] ROSINFORMBURO. Available at: http://www.rosinform.ru/mic/977259-o-klasterakh-i-tekhnoparkakh-i-kuda-mozhet-privesti-shelkovyy-put/ [Accessed 27 Jul. 2017].

Shpilenko, A., Labudin, M., Podkovyrov, A., Anosov, I., Romanov, R. (2016) *Technoparks of Russia-2015: Industry Review*. [online] Association of Clusters and Technoparks. Available at: ttp://nptechnopark.ru/news/assotsiatsija-klasterov-i-tekhnoparkov-podgotovila-otraslevojj-obzor-tekhnoparki-rossii-2015/ [Accessed 27 Jul. 2017].

Shukshunov, V.E. (2009) *Prospects for the development of technology parks in Russia.* [online] e-journal Accreditation in Education. Available at: http://www.akvobr.ru/perspektivy_razvitija_tehnoparkov_v_rossii.html. [Accessed 14 Aug. 2017].

Simachev, Y., Kuzyk, M., Zudin, N. (2016) ‘Import Dependence and Its Substitution in the Russian Manufacturing: Business Viewpoint’, *Foresight and STI Governance*, 10(4), pp. 25–45.

Simon, H. A. (1991) 'Bounded Rationality and Organizational Learning ', *Organization Science,* 2 (1), pp. 125-134.

Slack, N. and Lewis, M. (2002) *Operations Strategy.* 1st edn. Harlow: Prentice Hall.

Slappendel, C. (1996) 'Perspectives on innovation in organizations', *Organization Studies,* 17 (1), pp. 107-129.

Slotte-Kock, S. and Coviello, N. (2010) ' Entrepreneurship research on network processes: a review and ways forward ', *Entrepreneurship: Theory and Practice,* 34 (1), pp. 31-57.

Smallbone, D. and Welter, F. (2001) 'The Distinctiveness of Entrepreneurship in Transition Economies', *Small Business Economics,* 16 (4), pp. 249-262.

Smallbone, D. and Welter, F. (2009) *Entrepreneurship and Small Business Development in Post-Socialist Economies.* New York: Routledge.

Smallbone, D. and Welter, F. (2012) 'Entrepreneurship and institutional change in transition economies: The Commonwealth of Independent States, Central and Eastern Europe and China compared', *Entrepreneurship & Regional Development,* 24 (3-4), pp. 215-233.

Smith, D. A. and Lohrke, F. T. (2008) ' Entrepreneurial network development: Trusting in the process ', *Journal of Business Research,* 61 (4), pp. 315-322.

Sobrero, M. and Roberts, E. B. (2001) ' The Trade-off Between Efficiency and Learning in Interorganizational Relationships for Product Development ', *Management Science,* 47 (4), pp. 493-511.

Starbuck, W. H. (2014) 'Five stories that illustrate three generalizations about radical innovations', *Industrial Marketing Management,* 43 (8), pp. 1278-1283.

Sukharevskaya, A. (2016), *Oil and Gas Venture: how the Internet Initiatives Development Fund works*. [online] RBC. May 5, 2016, Available at: http://www.rbc.ru/magazine/2016/05/570fa16e9a794781cb616fa0 [Accessed 22 Aug. 2017].

Sukhova, S. (2017) ‘Digital Economy is not at all about the erasure of all borders: Interview with the President of NAIDIT Olga Uskova’, *Kommersant Publishing House, Ogonyok*, Available at: https://www.kommersant.ru/doc/3351715 [Accessed 26 Aug. 2017].

Swedberg, R. (2018) 'How to use Max Weber’s ideal type in sociological analysis', *Journal of Classical Sociology,* 18 (3), pp. 181-196.

TatCenter.ru (2005) *Bologna process in Russia - "shooting" the fundamental Russian education?* [online] TatCenter.ru. Available at: http://www.tatcenter.ru/print/26328/ [Accessed 22 Jul. 2017].

Tatikonda, M. V. and Rosenthal, S. R. (2000) 'Technology Novelty, Project Complexity, and Product Development Project Execution Success: A Deeper Look at Task Uncertainty in Product Innovation', *IEEE Transactions on Engineering Management,* 47 (1), pp. 74-87.

Tavassoli, S. and Karlsson, C. (2015) ' Persistence of various types of innovation analyzed and explained ', *Research Policy,* 44 (10), pp. 1887-1901.

Teece, D. J. (1998) 'Capturing Value from Knowledge Assets: The New Economy, Markets for Know-How, and Intangible Assets', *California Management Review,* 40 (3), pp. 55-79.

The Federal Tax Service (2016) *Unified Register of Small and Medium-Sized Businesses Moscow.* [online] Federal Tax Service. Available at: http://rcsme.ru/ru/library/ [Accessed 12 Aug. 2017].

Tidd, J., Bessant, J. and Pavitt, K. (2005) *Managing Innovation: Integrating Technological, Market and Organizational Change.,* 3rd edn., Chichester: John Wiley & Sons Ltd.

Tikhonov S. (2013) *A pantry of start-ups in Russia*. [online] Expert online. Available at: http://expert.ru/2013/12/27/kladovaya-startapov-rossii/ [Accessed 22 Aug. 2017].

Tödtling, F. and Trippl, M. (2005) 'One size fits all?: Towards a differentiated regional innovation policy approach', *Research Policy,* 34 (8), pp. 1203-1219.

Toft-Kehler, R., Wennberg, K. and Kim, P. H. (2013) 'Practice makes perfect: Entrepreneurial-experience curves and venture performance', *Journal of Business Venturing*, pp. 1-18.

Tolbert, C. J. and Mossberger, K. (2006) 'The Effects of E-Government on Trust and Confidence in Government', *Public Administration Review,* 66 (3), pp. 354-369.

Trott, P. (2008) *Innovation management and new product development,* 4th edn., Harlow: Pearson Education Limited.

Trukhanov, A. (2016) *The Information Technology Development Fund of the Ministry of Communications in 2016 will not get any money.* C News: High Technology Edition. Available at: http://www.cnews.ru/news/top/2016-12-08_fond_razvitiya_it_minkomsvyazi_v_2016_gdeneg_ne [Accessed 18 Aug. 2017].

Tsai, W. and Ghoshal, S. (1998) 'Social Capital and Value Creation: The Role of Intrafirm Networks', *The Academy of Management Journal,* 41 (4), pp. 464-476.

Turyakira, P. and Mbidde, C. (2015) ' Networking for SMES in Uganda: A conceptual paper ', *African Journal of Business Management*, 9 (2), pp. 43-49.

Turyakira, P. and Mbidde, C. (2015) ' Networking for SMES in Uganda: A conceptual paper ', *African Journal of Business Management*, 9 (2), pp. 43-49.

Tushman, M. L. and Anderson, P. (eds.) (2004) *Managing Strategic Innovation and Change: A Collection of Readings,* 2nd edn., Oxford: Oxford University Press.

Urmantseva, A. (2017) ‘The RAS machine was stuck in four years, Interview with academician Khokhlov A.R.’, [online] Moscow: RIA Novosti, Jul. 29, Available at: https://ria.ru/science/20170729/1499294783.html [Accessed 14 Jul. 2017].

Uskova, O. (2014) ‘High-tech games’, *Russian Business Newspaper - Innovations*, 938 (9), pp. 16-18

Uskova, O. (2017) *Engineers of the Future.* [online] Izvestia. Mar. 1, Available at: https://iz.ru/news/665767 [Accessed 22 Aug. 2017].

Utterback, J. M., and Abernathy, W. J. (1975) 'A dynamic model of process and product innovation', *Omega,* 3 (6), pp. 639-656.

Uzzi, B. (1996) ' The Sources and Consequences of Embeddedness for the Economic Performance of Organizations: The Network Effect ', *American Sociological Review,* 61 (4), pp. 674-698.

Val'kov, A.V. (2012) ‘Development of leadership qualities of an officer of internal troops in the educational process of a military high school’, *Young Scientist,* 8, pp. 312-315.

van de Ven, Andrew H. (1986) ' Central Problems in the Management of Innovation ', *Management Science,* 32 (5), pp. 590-607.

van Dijk, S., Berends, H., Jelinek, M., Romme, A. G. and Weggeman, M. (2011) 'Micro-Institutional Affordances and Strategies of Radical Innovation', 32 (11), pp. 1485-1513.

van Staveren, I. and Knorringa, P. (2007) ' Unpacking social capital in Economic Development: How social relations matter ', *Review of Social Economy,* 65 (1), pp. 107-135.

Vasiliev, R.B., Levochkina, G.A. (2012) ‘Evaluation of maturity of the Russian market of IT services’, *Business Informatics,* 2 (20), pp. 56-64

Vasilieva, A., Drankina, E. (2012) ‘The defense industry in the latest fashion’, [online] *Kommersant Money*, №51, Dec. 24, Available at: https://www.kommersant.ru/doc/2082651.

Verburg, R. M. and Andriessen, E. J. (2011) 'A typology of knowledge sharing networks in practice', *Knowledge and Process Management,* 18 (1), pp. 34-44.

Vladimirov, I. (2013) *What happens when officials start managing science can be seen in the failure of Rosnano and Skolkovo: Interview with S. Glazyev*. [online] The Russian Academy of Sciences. Available at: http://www.ras.ru/news/shownews.aspx?id=f8c36890-4c06-4276-b854-9218186db728&print=1 [Accessed 25 Jul. 2017].

Voynilov, Y.L., Gorodnikova, N.V., Gokhberg, L.M. (2017) *Science Indicators: 2017, Statistical Compendium*. Moscow: HSE.

Walker, G., Kogut, B. and Shan, W. (1997) 'Social Capital, Structural Holes and the Formation of an Industry Network ', *Organization Science,* 8 (2), pp. 109-125.

Wang, C. and Kafouros, M. I. (2009) 'What factors determine innovation performance in emerging economies? Evidence from China', *International Business Review,* 18 (6), pp. 606-616.

Wang, C. L. and Ahmed, P. K. (2004) 'The development and validation of the organizational innovativeness construct using confirmatory factor analysis', *European Journal of Innovation Management,* 7 (4), pp. 303-313.

Weber, J. M., Malhotra, D. and Murnighan, J. K. (2004) 'Normal Acts of Irrational Trust: Motivated Attributions and the Trust Development Process', *Research in Organizational Behavior,* 26, pp. 75-101.

Weber, M. (1949) '"Objectivity" in social science and social policy', in Weber, M. (ed.) *The Methodology of the Social Sciences*, Glencoe, IL: The Free Press.

West, A. (1992) *Innovation Strategy,* 2nd edn., New York: Prentice Hall.

Williamson, O. E. (1991) 'Comparative Economic Organization: The Analysis of Discrete Structural Alternatives', *Administrative Science Quarterly,* 36 (2), pp. 219-44.

Womack, J. P. and Jones, D. T. (2006) *Lean Thinking: Banish Waste And Create Wealth In Your Corporation,* 2nd edn., New York: Simon & Schuster.

World Bank (2016) *Russian Federation Systematic Country Diagnostic: Pathways to Inclusive Growth*. [online] The World Bank in the Russian Federation. Available at: http://pubdocs.worldbank.org/en/184311484167004822/Dec27-SCD-paper-eng.pdf [Accessed 22 Aug. 2017].

Yakovenko, K. (2012) *Innovative Finance*. [online] Financial One. Available at: https://fomag.ru/news/innovatsionnye-finansy/ [Accessed 14 Aug. 2017].

Yakubovich, V. (2005) 'Weak Ties, Information, and Influence: How Workers Find Jobs in a Local Russian Labor Market', *American Sociological Review,* 70 (3), pp. 408-421.

Zaretskaya, S.L., Kryshtanovskiy, A.O., Titova, N.L., Drugov, M.A., Mikhailuk, M.V., Vasilyev, D.A., Kapranova L.D., Klyachko T.L., Zaborovskaya A.S. (2002) *Adaptation Strategies for Higher Education Institutions: Economic and Sociological Aspect*. Library for the Development of Education, Moscow: Higher School of Economics

Zemtsov, S., Barinova, V. (2016) 'Change of paradigm of regional innovation policy in Russia: from levelling to clever specialisation', *Issues of Economics*, 10, pp. 65-81.

Zeng, S. X., Xie, X. M. and Tam, C. M. (2010) 'Relationship between cooperation networks and innovation performance of SMEs', *Technovation*, 30 (3), pp. 181-194.

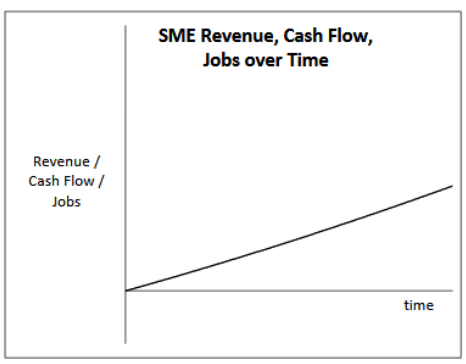
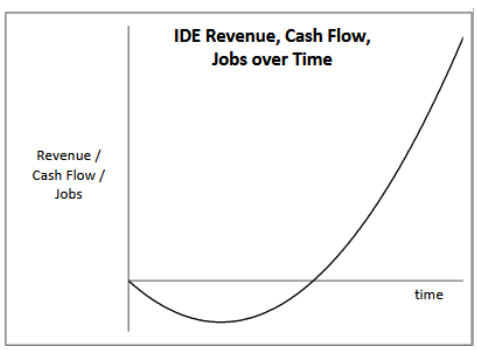
Zhao, F. (2005) 'Exploring the synergy between entrepreneurship and innovation', *International Journal of Entrepreneurial Behaviour & Research,* 11(1), pp. 25 – 41

Zhukov, E.F., Kapaeva, T.I., Litvinenko, L.T., et al. (2000) *International Economic Relations*, Moscow: UNITY-DANA.

Zhukova, L. (2016) *"We did not know where we were going": the Soviet intelligentsia about the events of the 1990s*, [online] Moscow: RIA-Novosti, Aug. 17, Available at: https://ria.ru/ussr25/20160817/1474499488.html [Accessed 14 Jul. 2017].

Appendix 1.1. Distinct features of conventional SMEs and innovation-driven enterprises

(adapted from Filley and Aldag, 1978, and Aulet, 2013)

	Conventional SME entrepreneurship	IDE entrepreneurship
Objectives	Market adaptation	Personal achievement
Strategy	Steady planned growth	Non-linear impulse development
Management style	Professional, rational decision making	Entrepreneurial style, personal leadership
Structure	Functional	Project
Workgroup bonds	Homogeneity	Interaction, expectation based
Attitude toward innovation	Not necessary for SME establishment and growth nor a source of competitive advantage	A source of competitive advantage; based on some sort of innovation (e.g., technological, process, business model)
Uncertainty/risk	Risk	Uncertainty
Basis for success	Planned adaptation to environment	Innovation deployment and market exploitation
Market	Focus on local and regional markets	Focus on global markets
Ownership	Most often family businesses or businesses with very little external capital	More diverse ownership base including wide array of external capital providers
Growth pattern	Typically grows at a linear rate; system (e.g., revenue, cash flow, jobs) responds quickly in a positive manner to investments	Starts by losing money will have exponential growth if successful; requires investments; system (e.g., revenue/cash flow/jobs) does not respond quickly to investments
		

Appendix 1.2. Six generations of innovation models

(Summarized from Rothwell (1G – 5G, 1994) and Nobelius (6G, 2004))

Generation	Driving mechanisms	Key features of innovation model
First (1G) Technology (push) (1950s – mid-1960s)	Technological opportunities	A linear progression from scientific discovery through technological development in firms to product availability in the marketplace
Second (2G) Market (pull) (Mid-1960s – early 1970s)	Demand-side factors	A sequential process that starts with market needs that direct R&D, which in its turn leads to solutions for manufacturing, with sales as the ultimate purpose
Third (3G) "Coupling" model (Early 1970s – mid-1980s)	Recognition of the importance of interaction between technological potential and market needs	Convergence of technological capabilities and market needs within the framework of firms' operations; a sequential multi-level process with numerous feedback loops linking signals from the market place and technological achievements to firms' operations; starts with idea generation induced by new needs and new technologies
Fourth (4G) Integrated Innovation Process (Mid 1980s – early 1990s)	Shortening of the product lifecycle and the speed of development, which results in time-based competition and a need to be a "fast innovator"	Parallel processes characterised by a high level of integration of firm departmental activities as well as connections upstream with suppliers and downstream with customers; the Japanese approach to raising production efficiency, i.e., "designing for manufacturability"; a web of external interactions that emphasises strategic networking and alliances
Fifth (5G) Systems Integration and Networking (Early 1990s – Early 2000s)	Information technologies are important; the emergence of knowledge economy; desire for greater flexibility and adaptability; competition based on a higher development speed and greater efficiency	A development of the fifth-generation model to quicken the innovation process and lower costs; a continuous innovation process resulting from systems integration and extensive networking in the form of strong inter-firm vertical linkages, external horizontal linkages (such as collaborative pre-competitive research, joint R&D ventures and R&D-based strategic alliances) and the use of sophisticated information technologies
Sixth (6G) Multi-technology cross-industry Networking (Early 2000s – present)	Multi-technology nature of new products that requires pulling together expertise from different industries; continuous growth of R&D complexity; increased number of aspects to entangle and actors to collaborate	Separation research and development with a research to become a result of joint cross-industrial, open intellectual collaborations in a form of loosely tied multi-dimensional innovation network; an innovation process resulting from utilisation of the resources from many firms working in different industries

Appendix 2.1. Key activities supportive of NIS development

In the first phase, 1991-1999

03.1990	The basic principles of joint-stock ownership are approved.
06.1990	The Regulation on Joint Stock Companies and Limited Liability Companies and the Regulation on Securities are approved.
03.1991	The Law on the Privatisation of State and Municipal Enterprises is approved.
01.1992	Decree issued on accelerating the privatisation of state and municipal enterprises.
04.1992	Presidential decree issued on urgent measures to preserve the scientific and technical potential of the Russian Federation, in accordance with which the Russian Foundation for Basic Research (RFBR) is established.
07.1992	The Law of the Russian Federation on Education is issued.
09.1992	The Patent Law of the Russian Federation is approved.
07.1993	The Law on Copyright and Related Rights is issued.
02.1994	The Foundation for Assistance for Small Innovative Enterprises in the Scientific and Technical Sphere (the Bortnik Foundation) is established. Among its main tasks are the creation and development of infrastructure for supporting small enterprises in the scientific and technical sphere; the creation of new jobs to effectively use of Russia's scientific and technical potential; the provision of financial, information and other assistance; activities to ensure the involvement of young people in innovation; and work to attract extra-budgetary investments in the sphere of innovative entrepreneurship.
07.1994	Presidential decree issued on the main provisions of the State Programme for the Privatisation of State and Municipal Enterprises in the Russian Federation after July 1, 1994. This decree relates to the corporatisation of large enterprises in the basic sectors of the economy that determine the country's production potential.
09.1994	The Russian Humanitarian Scientific Foundation is established.
04.1995	The government programme "Reforms and development of the Russian economy in 1995-1997" is introduced. The program includes a section entitled "Innovative and scientific and technical policy", which indicates priority areas for development, such as building a legal framework for regulating innovative, scientific and technical activities; implementing structural reforms in the science and technology sphere; and attracting investments in the areas of research, development, design and engineering.
06.1995	The Law on State Support of Small Business in the Russian Federation is passed.
10.1995	Governmental decree issued on federal research and production centres.
08.1996	The Law on Higher and Postgraduate Professional Education is issued.
01.1996	The State Institution "Centre for Technological Development" is established to provide financial support for science and technology projects and experimental development through targeted loan financing. The foundation provides financial and consulting support for Russian organisations' science and technology projects and experimental development, and provides a framework for international scientific and technical cooperation.
06.1996	The doctrine of the development of Russian science is introduced. The doctrine determines the most important principles of the state's scientific policy.
06.1996	The federal programme "State support of the integration of higher education and fundamental science for 1997-2000" is introduced. The programme aims to deepen and expand the interaction of academic and university science; improve the quality of education in order to preserve and develop the country's scientific and technical potential; develop joint fundamental research in higher-education institutions, the Russian Academy of Sciences, branch-based research institutes and state scientific centres; develop a fundamental research information base; develop an experimental and instrumental base for fundamental research for joint use by researchers, professors, students, graduate students and research organisations; and create conditions for enhancing the prestige of fundamental sciences in higher-education institutions.
08.1996	The Law on Science and State Science and Technology Policy is passed. The Law

	determines the main objectives of the state's scientific and technical policy.
11.1996	The federal scientific and technical programme for 1996-2000 "Research and development in the priority areas of the development of science and technology for civil purposes" begins. For the first time, a list of priorities for scientific and technological development is formulated. The science and technology sphere is ranked among the top priorities of the Russian Federation.
07.1998	The first concept for the innovation policy of the Russian Federation for 1998-2000 is developed. The document highlights that innovation policy is an important part of the state's social and economic policy. The key targets are to increase the efficiency of scientific achievements, and to ensure that the results of fundamental and applied research move into production.
04.1999	Adoption of the Federal Law on the status of the science city of the Russian Federation.
12.1999	Issuance of governmental decree on measures for the development of small enterprises in the sphere of material production and the promotion of their innovative activities. The decree also covers state support in this regard.

In the second phase, 2000-2005

2000	Educational standards for higher education (second generation).
09.2000	Introduction of the Doctrine of Information Security of the Russian Federation.
2000-2001	A series of federal programmes for the period 2002-2006 aimed at developing economic infrastructure: modernisation of the transport system, the building of an energy-efficient economy, the renewal and development of residential properties and commercial real estate, etc.
2001-2002	A series of federal programmes for the period 2002-2006 aimed at developing the information space: e-Russia, a special-purpose information and telecommunications system to support public authorities, and a united educational-information environment.
2001-2002	A series of federal programmes for the period 2002-2006 aimed at developing regions in Russia and supporting ethnic minorities.
2001-2002	A series of federal programmes for the period 2002-2006 aimed at solving social problems: Children of Russia, Youth of Russia, Senior Generation, social support for disabled people, Culture of Russia, the fight against socially significant diseases, etc.
2000-2001	Federal programmes for 2002-2006 aimed at developing the Russian judicial system and tax authorities, reforming the penal system, etc.
08.2001	Federal scientific and technical programme "Research and development in priority areas of science and technology development for 2002-2006".
09.2001	Federal programme "Integration of science and higher education in Russia for 2002-2006".
2002	Establishment of a non-commercial partnership "Russian Technology Transfer Network", an innovative infrastructure tool that allows for efficient dissemination of technological information. Users can search for partners in the implementation of innovative projects.
03.2002	Approval of "Fundamentals of the policy of the Russian Federation in the development of science and technology for the period until 2010 and beyond".
10.2002	Introduction of federal Law on insolvency (bankruptcy).
09.2003	The signing of the Bologna Declaration on the European space for higher education, which initiated the modernisation of Russia's education system on the basis of the principles of the Bologna Process.
2003-2004	Establishment of a deposit-insurance system on the basis of the Federal Law on the Insurance of Individual Deposits in the Banks of the Russian Federation, which determined the basic mechanisms for protecting the population's savings. The introduction of the deposit-insurance system was preceded by a thorough analysis of the financial soundness and management quality of each bank that applied for entry into the system. The assessment methodology and the deposit-insurance system itself were based on the recommendations of the Basel Committee on Banking Supervision of the Bank for International Settlements.
06.2004	Creation of the Federal Agency for Science and Innovation.
07.2005	Introduction of the Law on the placement of orders for the supply of goods, the performance of work, the provision of services for state and municipal needs.

07.2005	Introduction of the Law on Special Economic Zones in the Russian Federation.
08.2005	Approval of “Fundamentals of the policy of the Russian Federation in the field of science and technology development for the period until 2010 and further prospects”.
12.2005	Federal programme for the development of education for 2006-2010.

In the third phase, 2006-2008

2006	Establishment of the National Association of Innovation and Information Technology Development.
02.2006	Strategy for the Development of Science and Innovation in the Russian Federation for 2006-2015.
03.2006	Federal programme "Establishment of technoparks in the sphere of high technologies in the Russian Federation".
06.2006	Creation of the Russian investment fund for technology and innovation, known as the Russian Venture Company (RVC).
10.2006	Creation of the National Association of Business Angels, a non-profit partnership that brought together legal and physical persons, and private and institutional investors that invested in innovative high-tech companies as well as organisations providing services in the areas of investment and innovation.
10.2006	Federal programme "Research and development in priority areas of development of Russia's scientific and technological complex for 2007-2013".
12.2006	Adoption of the fourth part of the Civil Code, which determined the notions of intellectual activity results; legal protection of intellectual property; the legal status of authors of intellectual activity results; procedures for the state’s registration of such results; and possible ways of disposing of the author's exclusive rights, including a license agreement that resolved issues of succession. Part 4 of the Civil Code established state regulation of relations in the field of intellectual property, including approaches to resolving issues of protection of the rights and legitimate interests of rights holders associated with the results of innovative and technical activities, as well as liability for their violation.
01.2007	Federal programme "National Technological Base for 2007-2011".
2007	Creation of the state corporation “The Russian Corporation of Nanotechnologies” (RUSNANO) with the aim of developing nanotechnologies and creating new nanotechnology production; the State Atomic Energy Corporation (Rosatom); State Corporation for Developmental Assistance to Production and Export of Advanced Technology Industrial Products (Rostec).
06.2007	Amendments to certain legislative acts concerning favourable tax conditions for financing innovation activities.
06.2007	The Law on Protection of Competition, which defined the organisational and legal framework for the protection of competition, including the prevention and suppression of monopolistic activities and unfair competition; and prohibition, restriction and elimination of competition by authorities.
06.2007	The Law on the development of small and medium-sized enterprises.
02.2008	Adoption of the information society development strategy.
07.2008	Federal programme "Scientific and scientific-pedagogical staff of innovative Russia".
07.2008	The Law on the peculiarities of privatisation of state-owned property leased by small and medium-sized business entities in the Russian Federation, and on amending certain legislative acts related to such privatisation, including the participation of small and medium-sized enterprises in the privatisation of leased property.
10.2008	Presidential Decree on the implementation of a pilot project for the establishment of national research universities.
11.2008	Concept of long-term social and economic development through 2020.
12.2008	Anti-Corruption Law

In the fourth phase, 2009-2013

2009	Creation of an innovation and investment market, MOEX Innovations, as a subsidiary of the Moscow Stock Exchange.
05.2009	Adoption of The National Security Strategy of the Russian Federation until 2020.
10.2009	Establishment the RVC Seed Investment Fund.
2009-2014	Launch of the National Prize for Innovation "Zvorykin Prize", which is awarded

	annually following a multi-stage expert assessment of innovative projects. The contest is carried out within the framework of the activities of the Federal Agency for Youth Affairs.
08.2009	Adoption of the federal Law on amendments to certain legislative acts of the Russian Federation on the issues of creation of enterprises by budgetary scientific and educational institutions for the practical implementation of the results of intellectual activity.
09.2009	President Medvedev publishes an article on the Internet: “Russia, strive forward!”
02.2010	Adoption of the Military Doctrine of the Russian Federation.
03.2010	Abolishment of the Federal Agency for Science and Innovations and the Federal Agency for Education. The functions of the abolished agencies are transferred to the Ministry of Education and Science.
03.2010	Adoption of the “The fundamentals of Russian policy in the development of the defence industry through 2020 and beyond”.
04.2010	Issuance of governmental decree "On measures to attract leading scientists to Russian institutions of higher professional education, scientific institutions of state academies of science and state-sponsored scientific centres of the Russian Federation". A key measure is the allocation of governmental grants for scientific research conducted under the leadership of the best scientists in Russian institutions of higher professional education, scientific institutions of state academies of science and state-sponsored scientific centres.
04.2010	Issuance of governmental decree "On measures of state support for the development of cooperation of Russian higher-education institutions, state scientific institutions and organisations implementing comprehensive projects for the creation of high-tech production".
05.2010	Creation of the Association of Innovative Regions of Russia (AIRR).
07.2010	Creation of the non-profit Foundation for Infrastructure and Educational Programmes on the basis of the state-owned Russian Corporation of Nanotechnologies. Its goal is to develop an innovative infrastructure in the field of nanotechnologies, including the implementation of educational and infrastructure programmes already launched.
08.2010	Issuance of methodological recommendations on the development of Innovative Development Programs (IDPs) for joint-stock companies with state participation, state-owned corporations and federal state unitary enterprises.
09.2010	Adoption of the federal Law on the Innovation Centre Skolkovo. This project aims to create an enabling environment for the concentration of international intellectual capital capable of generating innovations.
09.2010	Issuance of governmental decree on the procedure for the formation of the state assignment for training students and doing research in public education institutions and the allocation of state budget funding for its fulfilment. This introduced new principles for financing scientific research and the provision of educational services by state-run organisations.
10.20010	Issuance of government decree "On the State Programme of the Russian Federation ‘Information Society (2011-2020)’".
2010	Launch of the federal target programme "Development of the Defence Industry Complex of the Russian Federation for 2011-2020".
2010	Transition to the third-generation standards of higher education, which provide for a competence-based approach and inclusion of entrepreneurial competencies as a separate category.
2010	Creation of the Association of Industrial Parks – a non-profit organisation that unites the majority of Russia's industrial parks and service providers active in the field of industrial construction with the goal of promoting common interests.
11.2010	Introduction of a system of tax benefits with the aim of supporting small and medium-sized enterprises, and the scientific, technical and innovative activities of organisations.
02.2011	Launch of the federal target programme “Development of Education for 2011-2015”.
02.2011	Launch of the federal target programme "Development of the pharmaceutical and medical industry of the Russian Federation for the period until 2020 and further prospects". This sets the goals for the transition of the pharmaceutical and medical industry to an innovative model of development through the technological modernisation of production; the development of scientific and research potential in state-sponsored science and higher-education institutions to ensure the production of strategically important medicines, and vital and essential medicines; and the introduction of Russian innovative products on the Russian and international

	markets.
06.2011	The working group of the Ministry of Education and Science receives sixteen scientific research proposals for mega-grants and awards mega-grants to six with international participation in Russia. The mega-projects include the thermonuclear facility "Ignitor", the neutron reactor PIK and the collider NICA. The implementation of mega-projects is aimed at ensuring the rise of the "big science".
06.2011	Amendment of the federal Law on Science and State Science and Technology Policy regarding the definition and regulation of state support for innovation activities.
06.2011	Issuance of governmental decree on the development of infrastructure allowing for the interaction of information systems used in state and municipal services, and on the undertaking of state and municipal functions using electronic tools.
07.2011	Launch of the innovation and investment market index, MICEX Innovation Index (MICEX INNOV).
07.2011	Establishment of the Club of Directors for Science and Innovation (iR & Dclub) – a professional community of top managers responsible for innovative development, science, technology policy and R&D in the largest Russian companies. It serves as a platform for sharing experiences and best practices, establishing horizontal links, and formulating and defending the interests of professionals in the fields of innovation management and R&D. The club is the result of an initiative by large private businesses and state-run companies on the basis of the Innovation Management Institute of the Higher School of Economics with the support of the Ministry of Economic Development of the Russian Federation, the Ministry of Education and Science of the Russian Federation, and the Russian Venture Company, with the participation of the Higher School of Economics.
07.2011	Issuance of the presidential decree on the approval of priority directions for the development of science and technology, and the list of critical technologies.
08.2011	Establishment of the Agency for Strategic Initiatives (ASI) to promote the social and professional mobility of young professionals and teams in medium-sized businesses and the social sector by supporting socially significant projects and initiatives. One of the supervised ASI projects is the "Creation of a National System of Qualifications and Competencies".
12.2011	Adoption of the strategy for innovative development of the Russian Federation for the period until 2020, which aims to restore Russia as a leader in fundamental science on the world stage.
2011	Creation of technological platform begins.
2011	Russia joins the World Trade Organization.
2011	Association of Technoparks is formed, which unites technoparks active in the high-tech sphere; later renamed the Association of Technoparks and Clusters.
01.2012	Adoption of the "Fundamentals of the policy of the Russian Federation for the development of science and technology for the period until 2020 and beyond". The strategic goal of the state policy is to ensure that Russia reaches a global level in terms of R&D and competitiveness in the areas defined as national scientific and technological priorities by 2020.
01.2012	Establishment of the VEB Innovation Fund – a fund for financial co-investments in innovative projects supported by the Skolkovo Foundation. The fund finances R&D and commercialisation through loans and equity investments.
02.2012	Work begins on the "Open Government" project in accordance with the presidential decree.
05.2012	On the day of his inauguration, President Putin signs a series of 11 decrees, which contain 218 assignments for implementation by official bodies from 2012 to 2020. The decree "On Long-Term State Economic Policy" indicates that the government has to take measures to achieve the technological leadership of the Russian economy through modernisation and innovative development.
06.2012	Creation of a Council under the President of the Russian Federation for Economic Modernisation and Innovative Development.
05.2012	Approval of the president's programme for upgrading the qualifications of engineering personnel, which covers the 2012-2014 period.
2012-present	RVC creates a “Tech Success” ranking in cooperation with the Association of Innovative Regions of Russia (AIRR) and other Russian development institutions.
10.2012	Creation of the Russian Foundation for Advanced Research Projects (the Russian equivalent of DARPA) to assist in the implementation of R&D necessary to achieve new results in the military-technical, technological and socio-economic spheres.
10.2012	First International Forum of Innovative Development "Open Innovations".

Mid-2012	Approval of the first roadmaps of the National Entrepreneurship Initiative (NIP), which include projects aimed at reducing administrative barriers in the economy and improving the investment climate.
11.2012	Adoption of the State Programme "Development of Education" for 2013-2020.
11.2012	Issuance of governmental decree "On the Programme for the gradual improvement of the wage system in the provision of state (municipal) services for 2013-2018" aimed at introducing an effective contract system for employees of social-sphere institutions, including those active in education, health care and social services.
12.2012	Launch of the federal target programme "Development of science and technology".
12.2012	Labour Code amended to include the terms "employee qualification" and "professional standard". Launch of the development of professional standards – documents that include a list of professional and personal requirements for employees throughout Russia. After the introduction of professional standards, the titles and necessary qualifications of relevant positions in organisations must correspond to the standards. Professional standards are developed through professional community initiatives and are approved by the government.
12.2012	Adoption of the Law on Education in the Russian Federation (in effect as of September 1, 2013), which establishes the legal, organisational and economic foundations of education, the basic principles of state policy in the field of education, and general rules for the functioning of the education system, the implementation of educational activities and the legal status of its participants. The law requires that professional standards be applied by educators.
2012	Establishment of the non-state-sponsored development institute "Innopraktika", which is a platform for consolidating the efforts of applied, fundamental and higher-education institutions' science to solve the most urgent tasks of enterprise development.
2013	Launch of the state programme to support the largest Russian universities, Project 5-100, which aims to increase the prestige of Russian higher education and move at least five universities into the top 100 universities in the three authoritative world rankings: Quacquarelli Symonds, Times Higher Education and Academic Ranking of World Universities.
04.2013	Adoption of the federal Law on the contract system in the sphere of procurement of goods and services for provision for state and municipal needs.
05.2013	Adoption of the federal target programme "Research and development on priority directions for the development of the Russian science and technology complex for 2014-2020".
05.2013	Adoption of the federal target programme "Scientific and Scientific Pedagogical Staff of Innovative Russia for 2014-2020".
06.2013	Issuance of the governmental decree "On measures to implement the transition to normative per capita financing of educational programmes of accredited higher-education institutions".
07.2013	Establishment of the Internet Initiatives Development Fund (IIDF), which performs the function of a non-state development institution and supports high-tech Internet-based projects.
07.2013	Launch of a unified information and analytics portal for state support of innovative business development "Innovations in Russia" (http://innovation.gov.ru/ru).
2013	Launch of GenerationS – the first Russian accelerator on the federal level.
09.2013	Development of a pilot project for the creation and development of engineering centres at Russia's leading technical universities within the framework of the roadmaps for engineering and industrial design.
09.2013	Adoption of the federal Law on the Russian Academy of Sciences (RAS), followed by the reorganisation of state academies of science and the introduction of amendments to certain legislative acts of the Russian Federation. Creation of the Federal Agency of Scientific Organisations (FASO) within the framework of the RAS reform. Merger of the Russian Academy of Sciences, the Russian Academy of Medical Sciences and the Agriculture Academies, and the transfer of the administration of their property to FASO.
10.2013	Introduction of the first professional standards through the presidential decree "On Measures to Implement State Social Policy".
11.2013	Approval of the Strategy for the development of the information-technology industry in the Russian Federation for 2014-2020 and for the Future to 2025.

In the fifth phase, 2014-2017

Early 2014-present	Transition to the system of professional standards. Integration of educational and professional standards in order to eliminate the imbalance between the needs of employers and the supply of labour generated by the educational process.
01. 2014	Adoption of the concept “Openness of Information about Federal Executive Bodies”.
02.2014	Winter Olympics held in Sochi.
03.2014	Referendum on the status of the Crimea and Sevastopol.
03.2014	Introduction of international sanctions against Russia.
2014	Launch of corporate-acceleration programmes within the framework of GenerationS.
2014	Reorganisation of The Russian Fund for Technological Development into the Industrial Development Fund. After the reorganisation, the programmes of the Russian Fund for Technological Development are terminated and new programmes for the development of Russian industry are developed. To encourage new industrial projects, the Fund provided targets loans on a competitive basis at an interest rate of 5% per annum for up to seven years. The loan amounts range from RUB 50-500 million. The Fund stimulates the inflow of direct investments into the real sector of the economy.
04.2014	Approval of the state programme "Economic development and innovative economy"
04.2014	Approval of the state programme "Development of Industry and Enhancing Its Competitiveness", which set goals for creating an innovative infrastructure for the development of new industries, the removal of regulatory barriers and the formation of favourable conditions for bringing innovative products to the market. The tasks are to develop industries oriented toward consumers by stimulating an increase in the share of extra-budgetary sources of financing, reduce the amount of state financing of industries and focus government support on stimulating demand. With respect to the defence-industrial complex, the task is to increase the efficiency of production for the development and production of new types of weapons and military equipment.
05-08.2014	Expansion of the list of international sanctions, including restrictions on Russian state-owned banks’ access to the capital markets of Canada, the US and the EU.
08.2014	Limits imposed on imports of various goods from countries that imposed sanctions on Russia and restrictions introduced on public procurement of foreign light-industry goods.
09.2014	Launch of an information-support platform by the Leadership Development Institute (Leader ID) – a strategic initiative of ASI implemented to engage civil society in innovative activities that consolidate human resources for the implementation of innovative projects. Creation of a system of young leaders.
10.2014	Issuance of governmental decree "On the selection of subjects of the Russian Federation eligible for state support in the form of subsidies for the reimbursement of the costs of creating, modernising and (or) reconstructing the infrastructure of industrial parks, industrial technology parks and technology parks in the sphere of high technology".
Second part of 2014	Expansion of the list of countries imposing sanctions. The sanction list now includes a ban on supplying Russia with weapons; equipment for the oil and gas sector; dual-use goods for defence companies; and services related to the exploration and production of deep-sea and Arctic oil, or shale-oil projects. Intensification of the restrictions on providing interbank credits to a number of Russian state banks and reductions in loan terms. Blocking of foreign assets held by Russian citizens and companies.
12.2014	Governmental resolution "On the specifics of the participation of small and medium-sized enterprises in procurement of goods, works, and services by individual types of legal entities", which specifies the participation of small and medium-sized enterprises in the public procurement of goods, works and services. The annual volume of purchases to be made from SMEs is set at no less than 18% of the aggregate annual value of contracts. At the same time, the annual volume of direct contracts with SMEs resulting from special competitive procedures should not be less than 10%.

12.2014	Adoption of the Law on Industrial Policy establishing the priority of industrial products produced in the Russian Federation in public procurement.
12.2014	Announcement of the need to launch the National Technology Initiative (NTI) – a programme to establish fundamentally new markets and create conditions for Russia's global technological leadership by 2035.
12.2014	Creation of the Educational Foundation "Talent and Success" and the educational centre "Sirius" in the city of Sochi on the basis of the Olympic infrastructure. The objectives are to create a network of additional education on a national scale; solve the tasks of identifying, developing and offering professional support to gifted children who have demonstrated outstanding abilities in the fields of arts, sports or natural science disciplines; and ensure success in technical creativity.
2014	Development of the national standard "Industrial parks: Requirements" with the participation of the Association of Industrial Parks.
2015	Creation of a geoinformation system of high-tech technoparks, industrial technoparks and industrial clusters designed to help investors and interested companies select the site most suitable for their production.
05.2015	Approval of the federal target programme for the Development of Education for 2016-2020.
06.2015	Establishment of the state institute for SMEs' development "The Federal Corporation for the Development of Small and Medium-Sized Enterprises" in accordance with the presidential decree on measures for the further development of small and medium-sized businesses.
06.2015	Decree on the procedure for forming a government assignment for the provision of public services in the sphere of education by higher-education institutions and the allocation of state financial support.
2015	Attempt to reform the funding system of the Russian Academy of Sciences with the aim of transitioning from state funding to allocating financial support on a competitive basis. The Ministry of Education and Science issues a draft order "On approving methodological recommendations on the allocation of subsidies to federal institutions performing state work in the field of scientific research and scientific and technical activities". The draft is rejected by the RAS and scientific institutes, and is returned for revision.
2015	RVC reformats GenerationS into a platform for the development of corporate accelerations.
2015	Introduction of a new contract for employees in the field of education.
06.2015	Development of roadmaps as the main instrument for the implementation of the National Technological Initiative. For each promising area, the roadmaps were defined by the professional community and approved by the government.
2015	Introduction of the strategic initiative "New model of the system of additional education for children", which aimed to create a new system of motivating children and implement a new generation of programmes for additional education. The initiative provides for the development of children through the participation of large industrial enterprises in the various regions.
07.2015	Methodical instruction on the development (actualisation) of Innovative Development Programs (IDPs) of joint-stock companies with state participation, state-owned corporations and federal state unitary enterprises.
31.12.2015	Issuance of the presidential decree "On the national security strategy of the Russian Federation".
2015-present	Establishment of the PRIORITY-2015 Prize – the first Russian award for enterprises that achieve significant success in the field of import substitution.
2015	Development of the national standard "High-tech technoparks. Requirements" by the Association of Clusters and Technoparks. On the basis of the standard, accreditation of technoparks begins and a national ranking is formed.
04.2016	Issuance of the governmental decree "On the implementation of the National Technological Initiative" (NTI).
05.2016	Approval of the state program "Development of the defence industry complex".

04.2016	Creation of the NTI project office as part of RVC. The office is responsible for project management; organisational, technical and expert-analytical support; and information and financial support for the development and implementation of action plans ("roadmaps") and NTI projects.
06.2016	Mass introduction of professional standards into government institutions. The transition to the mandatory use of professional standards in the private sector by 2020 is announced.
06.2016	Adoption of the strategy for the development of small and medium-sized entrepreneurship for the period up to 2030.
06.2016	Launch of a priority "National Champions" project to support private, leading, high-tech companies. The goals are to ensure the rapid growth of domestic, private, high-tech, export-oriented companies and to provide assistance in the formation of transnational companies based in Russia. Participating companies are selected from among the companies included in the Tech Success ranking.
06.2016	A change in the approach to the implementation of national innovation policy signified by the creation of a Council under the President of the Russian Federation for Strategic Development and Priority Projects (the government's project office), which works on the basis of project-management principles. The Council is endowed with special powers and its decisions are excluded from the standard, highly complicated interdepartmental approval procedures.
09.2016	Launch of the on-line service "Business navigator for SMEs", which is designed to simplify the process of opening a new business. Anyone can register, test the demand for a new business, and estimate the payback period. One of the portal's basic functions is to provide single-point access to information about all types of federal, regional and municipal support available for SMEs as well as instruments of financial support.
11.2016	Approval of the priority project "Universities as centres of innovation creation" aimed at strengthening the global competitiveness of Russian universities, and creating university-based centres focused on the innovative, technological and social development of regions.
11.2016	Adoption of the decree on granting subsidies from the federal budget to Russian organisations for compensating part of the costs of production and sales of pilot lots of means of production to customers in 2016", which provides for compensation of up to 50% of costs actually incurred by an industrial enterprise when implementing modern, high-tech means of production in a pilot project.
12.2016	Approval of the strategy for scientific and technological development of the Russian Federation, which is aimed at the formation of a modern management system in the fields of science, technology and innovation, and at ensuring the innovative attractiveness of R&D.
12.2016	Approval of the priority project on the main direction of Russia's strategic development "Small business development and support provision for individual entrepreneurial initiatives".
12.2016	Creation of Association of Brokers of Innovations and Technologies.
2016	Format of GenerationS-2016 changed to bring together eight corporate accelerators in the following areas: agro, biotech and food; creative industries; finance and banking technologies; life sciences; mining and metals; power and energy; smart city; and technet.
2016	Launch of the project "Development of innovative clusters – leaders of investment attractiveness at the world level".
01.2017	Information Technology Development Fund (ITDF) created
01.2017	Entry into force of the governmental decree establishing the priority of goods of Russian origin in the procurement of goods, works, services by certain types of legal entities.
05.2017	Extension of the programme to support the introduction of new high-tech means of production among Russian organisations through subsidies from the federal budget
05.2017	Establishment of the National Association for Technology Transfer.

05.2017	Approval of the Strategy for the Development of the Information Society in the Russian Federation for 2017-2030
06.2017	Approval of the plan for the implementation of the Strategy for Science and Technology Development of Russia for 2017-2019. The plan includes the creation of the federal target programme "Scientific and Technological Development of the Russian Federation", which provides for the integration of fundamental and applied research programmes with technology-development programmes in priority areas. The strategy also provides for the creation of opportunities for taking advantage of the creative potential of young people in the field of science and innovation, including opportunities within the framework of international scientific and technical cooperation.
07.2017	Approval of the federal programme "Digital Economy of the Russian Federation" to complement the goals and tasks implemented under the framework of the National Technological Initiative.
08.2017	Introduction of new sanctions by the US that affect the terms for granting loans to Russian banks.

Appendix 2.2. Summary of features of the Russian NIS and their implications for innovative activity

	Phase 1 (December 1991 – December 1999)	Phase 2 (2000 – 2005)	Phase 3 (2006 – 2008)	Phase 4 (2009 – 2013)	Phase 5 (2014 – 2018)
NIS actors					
• Composition	Many groups of key actors are absent	Many groups of actors are missing. Separate functions are carried out by various state bodies and structures.	The emergence of a vision for the systematic development of NIS. The emergence of the first development institutions. The emergence of the first players in the venture industry.	The emergence of a wide range of NIS actors. The manifestation of interest from foreign actors and global NIS players.	Basically, all key groups of key actors are represented. Evolutionary processes of the emergence and disappearance of various actors. Interest among foreign actors declines. System players that specialise in technology transfer are weakly developed.
• Level of actors' expertise and understanding of their roles	Absent	An understanding of the NIS concept and its vision as a system has not been fully established. Study of foreign experience.	The beginning of a systemic understanding and experimentation with the application of foreign experience by the state and NIS actors.	Acquisition and accumulation of experience through practical activities. Different cognitive frames among NIS actors, who are experimenting to find their place in the system.	Systematisation of experience and learning from mistakes. A clearer vision of actors' roles and places in the NIS. Actors have mostly decided on their strategies.
Governance					
• Focus	Preservation of the existing potential and prevention of the country's collapse.	Restoration of scientific potential and creation of basic conditions for social life.	Development of scientific potential. Development of a vision of the role of innovation in economic development. Start of the development of innovative infrastructure.	Stimulation of the emergence of a wide range of diverse instruments for the development of technological entrepreneurship. Support of emergence of vertical and horizontal links in the system. Stimulation of the emergence of financing instruments and markets for innovative products.	The increase in the effectiveness of institutions and the further development of framework conditions. Facilitation of the development of horizontal links in the NIS. Coordination of the efforts of NIS players. Stimulation of the development of markets and the effectiveness of financial instruments.

• Regulative pillar	Laws regulating the emergence of private capital and the protection of property rights. Laws in the fields of education and technology policy.	Development of the legislative and executive system, the federal law on insolvency (bankruptcy), and laws regulating the emergence and development of basic social institutions and systems.	Laws that affect the development of the market and interactions among its participants, such as antitrust and anti-corruption laws. Development of a comprehensive legislative framework for entrepreneurship. Laws in the sphere of education, science and technology. Concept of long-term social and economic development (Strategy 2020). Strategy for the Development of Science and Innovation.	Laws that affect the development of economic relations in the system, the development of social systems, the integration of science and education, and the functioning of state structures and mechanisms, including public procurement.	A legislative framework aimed at setting standards for business activities, establishing principles for assessing the effectiveness of state structures and providing public funding, and perfecting the system of supporting SMEs (including at the regional level).
• Normative pillar	The transition to a market economy. The fight against organised crime. The institutionalisation of entrepreneurship as a phenomenon.	Programmes for the development of social and economic infrastructure (including at the regional level), and to ensure the protection of the rights of the population. Introduction of practices that integrate Russia into the international community (e.g., the deposit-insurance system, the Bologna Declaration on the European space for higher education).	The beginning of the development of civilised business. The beginning of the formation of business-related infrastructure.	The active development of business and entrepreneurship. Russia's integration into the world community (e.g., joining the WTO). Start of the innovative development path. Cultivation and formalisation of business relations. The increase in the transparency and accessibility of information. The emergence of the first professional standards.	The formalisation and streamlining of processes and relations. The strengthening of the regulative role of the state. Introduction of a large number of standards to regulate professional activity. The increase in reporting requirements. The growth in bureaucracy, and, consequently, the perceived reduction in the freedom to make decisions and conduct business. The emergence of more efficient electronic services. The need to rally against the threat of foreign sanctions and imposed restrictions on doing business.
• Cultural-cognitive pillar	Negative attitude towards the collapse of the country and the resulting	Lack of a common understanding of the direction of the country's development.	Lack of a common understanding of the direction of the country's development. Continuation	Cautious attitude toward innovation. Recognition that innovative development can remove the	Consolidation of a professional innovation community around NTI ideas. More positive view of innovative development as

	destruction of industry, science and social structures. The task of survival. Departure of highly qualified personnel.	Development takes place in isolated professional communities.	of development in individual professional communities, among which there are no effective links. Increased tension due to the lack of understanding of development prospects.	dependence on raw materials. Concerns that society may be deceived again and that people in power may steal state money. High degree of uncertainty. The second wave of departures.	necessary for countering geopolitical risks.
• Coordination	The leading role of the state. A large number of social issues do not receive attention due to a lack of resources. Spontaneous self-organisation, including elements of criminalisation.	The leading role of the state. In some areas, splicing of criminal control with state control. Emergence of a clan economy.	The state tries to stimulate the emergence of self-regulating, professional structures and to implement management through private-state structures.	Attempts to involve broad sections of society and groups of actors in making decisions, and initiating and governing innovation activities. Provision of financial support for private initiatives helpful for development of the innovation infrastructure.	The significant role of the state in consolidating vertical and horizontal innovation-governance structures.
Framework conditions					
• Basic conditions for social life	Very poor conditions.	Start of recovery.	Solution of key and pressing problems.	Active work to create a systematic approach.	Perfection of the system with active inclusion of public opinion through e-government systems.
• Institutions	Unlinked elements inherited from the Soviet Union. Broken relations. Innovative issues not a priority.	Separate tasks that relate to the development of the innovation system are entrusted to different state structures that are not acting in concert.	Experiments to create individual flagship development institutions. The lack of a comprehensive vision.	Boom in the development of institutions. Randomness, multidimensionality and intersection of areas of responsibility. Competition between development institutions for resources, projects and spheres of influence.	The existing approaches become more structured. The streamlining efforts of NIS actors are based on NTI as a key framework.
• Knowledge-generation base	Destroyed. Outflow of qualified specialists.	Attempts to restore the knowledge-generation base, prevent diversion and attract specialists	Focus on development in areas in which Russia was historically competent and competitive. A high degree	A focus on development in relevant areas. The desire of scientists to choose the priority areas for the	Focus on supporting the development of the markets of the future (NTI markets). Establishment of priorities in

		from abroad.	of independence in decision making in the scientific community.	development of science.	cooperation with the industry.
• Knowledge-absorption and exploitation base	The destruction of the industrial base in the first half. The privatisation of the means of production. The transition to doing business under market-relations conditions. The looting of the material base. The criminalisation of business.	Development aimed at survival and rapid enrichment. The extinction of the material base of production in large companies. The building of business relations within the clan economy.	The beginning of the structuring of markets and the regulation of market relations. The beginning of the functioning of markets based on the principles of competition.	Development of dependence on imported components and materials. A non-diversified economy with monopolised markets and a high proportion of state corporations. The requirement for state corporations to establish innovative development programs.	Coercion for innovation. Introduction of performance indicators focused on the use of innovative programmes and the development of innovative products. Stimulation of the demand for innovation.
• Conditions for entrepreneurship development	Practically absent. Spontaneous entrepreneurship, based mainly on the resale of goods.	Separate initiatives and development measures. Support for the development of entrepreneurship in the underprivileged layers of the population.	The structuring of instruments to support the development of entrepreneurship. Development of more systematic, targeted development programmes at the regional level. Ease of Doing Business Index (DBI) as of 2006: 95.	Development of support instruments. The beginning of systematic work on the formation of favourable framework conditions for doing business. DBI as of 2009: 120.	Perfection of the framework conditions and support programs in the regions. Development of a methodology to assess results and to ensure the effectiveness of development programmes. DBI as of 2014: 92. DBI as of 2018: 35.
• Entrepreneurial culture	Absent. Negative attitude in society.	Entrepreneurship as a way of survival for the population and a way of solving social problems for the state. The beginning of the development of Russian production and service companies.	Entrepreneurship as a tool for the development of regional economies.	Emphasis on technological entrepreneurship. Growth in the number of start-ups, including technology-driven start-ups.	Overall reduction in the number of start-ups. Individual cases of success of technological enterprises. Lack of growth in established companies.
• Commercialisation infrastructure	Absent.	Distinct, non-systemic initiatives.	Experimentation with the implementation of individual	Development of a wide range of systems and	The building of relationships through the actions of various

			elements seen abroad.	structures to support technological entrepreneurship, mainly through public funding. The contribution of large companies to development is insignificant.	actors and the introduction of logic in the commercialisation system. Requirements to increase the efficiency of the systems. The transition to self-sufficiency. More active involvement in the processes of large companies. Development of regional systems.
• Markets for innovative products	Absent. Ready-to-use foreign products are utilised.	Absent. Active use of foreign technologies and components. Raw materials for setting up local production, often in partnership with foreign companies.	Absent. Dependence on foreign technologies, components and raw materials.	The emergence of a focus on innovative products following a wave of general interest and discussion. A cautious attitude towards Russian products because of quality concerns. Implementation of measures to stimulate the use of innovative Russian solutions.	Weakly developed, but development increases following the wave of sanctions as well as restrictions on access to foreign R&D and technologies. Reciprocal restrictive measures for foreign companies operating in Russian territory resulting in the localisation of production and more active use of locally produced components. A small increase in corporate activity as a result of measures stimulating innovation.
• Sources of financial support for R&D	State support aimed at preserving the existing potential.	State support aimed at preserving and developing the existing potential.	State support aimed at developing existing capacity and stimulating the establishment of links with business.	State support aimed at developing priority areas. Support of the creation of innovative infrastructure at universities. Motivation of universities to carry out activities for the commercialisation of developments and the transition to the concept of an entrepreneurial university.	Carried out at the expense of public funds (70%). R&D activities focused on supporting NTI projects. The financing of R&D projects that are requested by businesses, subject to co-financing by private capital.
• Sources of financial support	Self-financing.	Self-financing.	Self-financing. Regional programmes for the	Self-financing. Regional entrepreneurship-	Self-financing. Regional entrepreneurship-development

for innovative companies			development of entrepreneurship. The emergence of venture financing (private and public-private capital).	development programmes. State grant support. Activation of venture financing (private and public-private capital).	programmes. State grant support. Reduction in venture financing. Small flow of financing from large companies.
Innovative activity	Departure of a large number of engineers and the destruction of the system for the creation of technological developments. Technological entrepreneurialism exists at the level of the inventor acting in his own garage or the university laboratory. Single cases of commercialisation.	An attempt to revive the system of research and development. Non-systematic activities, mainly related to previously established relations with business, including within the framework of several territorial clusters.	Non-systemic activity. Examples of successful development in several clusters.	The emergence of the opportunity for independent innovators to commercialise developments from previous periods through the support of development institutions. An attempt to stimulate the development of innovative activities within the concept of the "entrepreneurial university" to ensure successful commercialisation. Active development of activities within the clusters.	Innovative activity carried out on the basis of higher-education institutions (particularly productive examples are the consortiums of universities and industrial companies), in numerous accelerators, technoparks of regional and federal importance, in clusters, and in various projects related to the implementation of NTI.

Appendix 3.1. Interview Guide

Section 1 *(Questions 1-30, 15-20 minutes)*	**Comments**			
1. What is your name?				
2. What is the name of your company?				
3. What is your position in the company?				
4. What does your company do? *(Brief description of the product or service)*				
5. What was your main motive for founding a company?				
6. Who are your customers?				
7. In which city is the company registered?				
8. Is your company independent or is it a spin-off?	☐ Independent company ☐ Spin-off (corporate entrepreneurship). What is the parent company? _____			
9. How old is the company (business project)?	*From the beginning of active work on the project to the present* _____ *years* _____ *months*			
10. What is the aim of your company business?	☐ To implement a technology in the market ☐ To serve a particular client segment ☐ To satisfy customers by applying or developing a technology			
11. Is this your first entrepreneurial experience?	☐ Yes. ☐ No. What companies have you founded before? What is their current status? _____			
12. What stages of development has your company gone through to date? Which stages do you view as the most important for ensuring the success of your business? *(Open-ended question. Select all stages realised to date from the prompts on the right.)*	☐ Idea generation ☐ Idea verification ☐ Prototype ☐ Market evaluation ☐ Product/service development ☐ Minimum viable product ☐ Product validation ☐ Business-model design		☐ Engineering of product and business processes ☐ Company founding ☐ Start of sales ☐ Market penetration ☐ Sales growth ☐ Scaling and diffusion ☐ Business exit ☐ Other _____	
13. How many people were founders of this business?	☐ 1	☐ 2 or 3	☐ 4 or 5	☐ More than 5
14. What educational background(s) do the founders have? *(Select all that apply.)*	***Subject(s):*** ☐ Technical ☐ Management or economics ☐ Liberal arts (but not management or economics) ☐ Creative studies (e.g., artist, designer, animator) ☐ Other _____		***Level(s):*** ☐ Secondary professional education ☐ Specialist diploma (Russian) ☐ Bachelor's degree (Russian) ☐ Master's degree (Russian) ☐ Candidate of Science (Russian) ☐ Doctor of Science (Russian) ☐ Foreign university undergraduate degree ☐ Foreign university postgraduate degree ☐ Foreign university PhD ☐ Other: _____	
15. What professional background(s) (experience) do the founders have? *(Select all that apply.)*	☐ State employee ☐ Employee of an SME ☐ Employee of a large company (over 250 people) ☐ Russian company employee ☐ Foreign company employee ☐ Member of the start-up team (but not the founder)		☐ Technological start-up founder ☐ Traditional SME owner ☐ Freelancer ☐ Professional business consultant ☐ Student ☐ Other: _____	

16. What were the ages of the key founders at the time of founding? *(Select all that apply.)*	□ 18-24 □ 25-30 □ 31-39	□ 40-49 □ 50-59 □ 60 and above
17. How many people are currently employed by your company? *(Select all that apply.)*	□ 1 □ 2-5 □ 6-15 □ 16-50	□ 51-100 □ 101-250 □ More than 250 people □ Company has closed
18. Does the company exist independently or is it a resident of a start-up development system?	□ Co-working resident □ Business accelerator resident □ Incubator resident □ Technological park resident □ Works on the premises of the parent company (corporation or institution	□ Has or rents its own office □ Works "from home" or from a friend's office □ Other:_____ _____
19. What was the main focus of investments during the initial stages of company development?		
20. What sources of financing were involved in building your company? *(Open-ended question. Listen attentively. Mark the relevant categories on the right.)*	□ Personal and family's/friends' savings □ Capital of the parent company □ State research grant □ Grant (start-up competition winner) □ Crowdfunding □ Business angel capital □ Pre-seed and seed venture capital	□ Venture capital (round A) □ Venture capital (round B) □ Equity crowdfunding □ Bank loan for entrepreneurs □ Corporate venture funds □ Cash-out strategy □ Merger/acquisition □ IPO □ Other:_____
21. What is the geographical range of the company's sales?		
22. How long has the product or service been present on the market? How big is the client base?		
23. What is the degree of novelty in the business venture? *(Open-ended question. Listen attentively. Try to determine the category yourself and check your understanding with the respondent. If needed, ask the respondent to help determine the most appropriate category.)*	□ Use of an existing and proven (by others) business model (without significant adaptations) □ Radical innovation (new to the market or new to the industry; can be related to discoveries) □ Incremental innovations (better exploitation of business solutions variation, design improvements, refinement of routines and instruments used) □ Adaptation of existing business model to meet the needs of local customers	□ Use or adaptation of existing technology to create new value for customers □ Architectural innovation (basic business concept is untouched but the way in which the components are linked is significantly changed) □ Modular innovation (the core technology is changed, although the basic structure of linkages within the product's architecture remains the same) □ Other: _____
24. What is new in the project? *(Open-ended question. Listen attentively. Try to determine the category yourself and check your understanding with the respondent. If needed, ask the respondent to help determine the most appropriate categories.)*	□ New technology □ New business- and profit-generating model □ New configuration of assets and people inside the organisation □ New methods of producing or delivering goods or services □ New administrative and control systems, or new leadership structure	□ New type of external relations (external networks) □ Product with new characteristics □ Product with new intended use □ New service offering □ New customer-support system □ New distribution channel □ New brand □ New method of customer engagement □ Other:
25. Does your company have registered patents?		
26. How do you assess the overall business success of your company?	□ Complete success □ Medium success □ Little success □ Too early to say	

27. To what extent did your product or service create value for customers and match their expectations at the time of its market launch, in your opinion? *(Product-value proposition)*	□ Full match □ General match but minor improvements required □ Overall product/service concept perceived positively, but the implementation itself required serious revision and improvement	□ Product/service concept required significant changes and approach to its implementation required significant amendments □ Initial product/service concept failed and everything was redone □ Initial product/service concept failed and the new venture was abandoned
28. How effective was the business model you initially designed and used to generate profit in your opinion? *(Business-model proposition)*	□ Very effective □ Generally effective, although some minor improvements were still needed □ Business model as a whole was working, but the implementation (separate blocks) required serious revisions	□ Significant changes were required in the business-model structure and in its separate blocks □ Initial business model idea was abandoned and the business model was completely redesigned □ The business model failed completely and the new venture was abandoned

29. How successful was the entrepreneurial venture with regards to the correspondence of the current situation with the expectations of the founders and investors in terms of ... *(Growth proposition)*

	Degree of conformity between plans and results (% of deviation from the plan)				
	0% No deviations	*No more than 20%*	*No more than 40%*	*No more than 60%*	*More than 60%*
Appearance of first customers	□	□	□	□	□ *or no customers yet*
Compliance with sales plan	□	□	□	□	□ *or no customers yet*
Compliance with planned budget	□	□	□	□	□
Compliance with planned timeframe	□	□	□	□	□

30. Have there been any significant changes in the strategy ("pivots") during the course of your entrepreneurial venture (from the time you started developing an idea to bringing the product/service to the market)? *(Open-ended question. Listen attentively. Try to determine the category yourself and check your understanding with the respondent. If needed, ask the respondent to help determine the most appropriate categories.)*	□ Zoom-in pivot □ Zoom-out pivot □ Customer-segment pivot □ Customer-need pivot □ Platform pivot	□ Business-architecture pivot □ Value-capture pivot (monetisation pivot) □ Growth-engine pivot □ Channel pivot □ Technology pivot
Block 2 ***(Questions 31-45, 25-30 minutes)***	**Comments** *(to be filled in during the interview by the interviewer; the respondent does not write anything)*	
31. In your opinion, what role did external relationships (contacts) play in the founding and development of your business? In what sense was networking important for you personally? *Network purpose*		
32. How much time did you spend on purposefully searching for and maintaining contacts (on average; hours per week)? *Network involvement*	□ Less than 1 hour per week □ 2-5 hours per week	□ 6-10 hours per week □ More than 10 hours per week

33. How did you find the contacts you needed to build your business? Which contact sources did you use and why?
(Open-ended question. Try to understand whether there is some logic/consistency in the search for contacts. If the logic is evident, check your understanding with probing questions. Mark the appropriate network sources.)

Network sources

- ☐ Relatives
- ☐ Friends
- ☐ Previous professional contacts (e.g., former partners, customers, suppliers)
- ☐ Previous professional relations (studied or worked together)
- ☐ Referrals and recommendations of friends and acquaintances
- ☐ Personal web pages on Internet-based social networks
- ☐ Participation in professional industry conferences
- ☐ Participation in professional exhibitions
- ☐ Membership in a professional organization (specify which ones)

_____

- ☐ Through channels of the parent company
- ☐ As a result of participation in an accelerator
- ☐ As a result of a presence in an incubator or technological park
- ☐ Participation in conferences/seminars for entrepreneurs
- ☐ Tracking or participating in Internet platforms for entrepreneurs
- ☐ Membership in entrepreneurial associations (please, specify)

_____

- ☐ Participation in other entrepreneurial development projects (please, specify)

_____

- ☐ Other _____

34. Were some relationships so important that they determined the business's success in terms of growth and performance?
Relationship between networking and outcomes

35. 1) With whom did you establish relationships in order to found and develop your company?
Size, diversity and heterogeneity of links

2) How often did you communicate with these people or organisations while founding and developing your company? In certain stages of development, did the intensity of communications with some network members increase or decrease? How would you explain this?
Frequency of communications

Relationships with organisations

1. Customers
2. Partners
3. Other organisations in the industry
4. Organisations in related industries
5. Scientific/research centres
6. Engineering centres
7. Business-sector professional associations
8. Consulting organisations
9. Organisations that provide professional services (accounting, legal, patent, other _____)
10. Institutions for entrepreneurship development
11. Entrepreneurial associations
12. Venture-capital institutions
13. Higher-education institutions
14. Other _____

Person-to-person relationships

15. Family and kin
16. Friends
17. Acquaintances (e.g., studied together, co-participated in social events or sports)
18. Previous professional contacts (e.g., colleagues, customer representatives, partners)
19. Like-minded people in social networks
20. Scientists
21. Engineers/developers
22. Other entrepreneurs
23. Business consultants
24. Freelancers (e.g., accountants, marketers, analysts, lawyers)
25. Representatives of the venture environment
26. Specialists in the industry
27. Specialists in related industries
28. Other _____

36. How familiar are the people within your network?
Network density

- ☐ Almost everyone knows each other.
- ☐ Some people know each other, but not all.
- ☐ People generally do not know each other.

37. What relationships did you use for the purposes of founding and developing your company? Please provide examples.
(Open-ended question. Mark the purposes discussed by the respondent. Use the prompts to determine which relations were used to support the achievement of other aims.)
Network aims

Purpose	Relationships used
☐ Acquisition of lacking knowledge or competences	
☐ Technological research and development	
☐ Product/service development	
☐ Understanding of industry and competitive environment	
☐ Market evaluation, product testing, search for distribution channels	
☐ Establishment of company as a legal entity	
☐ Attract human capital	
☐ Construct social capital	
☐ Other	

38. What role does trust play in building a business relationship? How does trust between business participants change over time? *Role and evolution of trust*		
39. How do you govern your network of business contacts? *Network governance*	*Balance between weak and strong (embedded) ties.* *How does the respondent develop, supplement, strengthen, or leave relationships? Is it generally a random process?* *Are there any international network members? If yes, why?*	
40. In terms of your company's development, how has your network of relationships evolved over time? *Network evolution*	**Types of evolution to be discussed** ☐ Evolution along the life cycle of a start-up ☐ Evolution (modification) of individual ties over time ☐ Evolution of the strategy and practice of constructing networks as the entrepreneur acquires experience	
41. Did any previously established relationships harm the development of the business? *Impact of embeddedness*		
42. What mistakes in building business ties would you advise novice entrepreneurs to avoid? *Impact of experience*		
43. Contact details that I authorise the researchers to use to contact me in case of additional questions	Respondent contact phone number _____	E-mail _____
44. Date		
45. Signature		

Thank you for your invaluable contribution to our research and your time!

Appendix 3.2. Control variables

Variable	Interview guide question	Coding system
Factual information about the SME (Section 1 questions)		
V1 Company name	Q2	
V2 Company profile	Q4	
V3 Respondent name	Q1	
V4 Business sector	Q4	1 Production 2 B2C services 3 IT sector 4 B2B/B2G services 5 Wholesale and retail trade
V5 Market type	Q6	1 B2C 2 B2B 3 B2G
V6 Age of company/ NIS development phase	Q9	0 More than 25 years – Phase 0 (1991 or earlier) 1 16-25 years – Phase 1 (end of 1991-1999) 2 12-15 years – Phase 2 (2000-2005) 3 9-11 years – Phase 3 (2006-2008) 4 4-8 years – Phase 4 (2009-2013) 5 3 years or less – Phase 5 (2014-2017)
V7 Business aim	Q10	1 To implement a technology in the market 2 To serve a particular client segment 3 To satisfy customers by applying or developing a technology
V8 Type of innovation	Q23	1 Use of an existing and proven (by others) business model 2 Radical innovation 3 Incremental innovation 4 Adaptation of existing business model to meet the needs of local customers 5 Adaptation of existing technology to create new value for customers 6 Architectural innovation 7 Modular innovation
V9 SME innovativeness	Synthesis of Q10, Q23, Q24, Q25	1 **High** – a technological company that is implementing a radical innovation or a combination of more than two types of innovations; has patents 2 **Medium** – a company that is implementing an adaptation of an existing technology, or an architectural or modular innovation 3 **Low** – a company that is implementing incremental innovations 4 **None** – a company that uses an existing business model or a minor adaptation of such a model to satisfy the needs of a particular client segment; does not have patents
V10 Registered patents	Q23	1 Yes 2 No
V11 Stage of company/project development by interview date	Q12	1 Idea generation 2 Idea verification 3 Prototype 4 Market evaluation 5 Product/service development 6 Minimum viable product 7 Product validation 8 Business-model design 9 Engineering of product and business processes 10 Company founding 11 Start of sales 12 Market penetration 13 Sales growth 14 Scaling and diffusion

		15 Business exit 16 Other	
V12 Perceived overall business success of company	Q26	1 High 2 Medium 3 Low 4 Too early to say	
V13 Conformity of results with expectations/plans	Synthesis of Q27, Q28, Q29	1 **High** – Q27: full/general match; Q28: very/generally effective; Q29: deviation of no more than 20% 2 **Medium** – Q27: revision/improvement in product/service concept; Q28: revision/improvement of business model; Q29: deviation of no more than 40% 3 **Low** – Q27: significant changes in product/service concept; Q28: significant changes in business model; Q29: deviation of no more than 60% 4 **None** – Q27: product/service concept failed; Q28: business model failed; Q29: deviation of more than 60%	
Founders' education	Q14	**V14 Technical** **V15 Management or economics** **V16 Liberal arts (but not management or economics)** **V17 Creative studies** **V18 Other**	1 Yes 2 No
V19 Founders' entrepreneurial background	Q15	1 Yes 2 No	
V20 Ages of key founders at time of establishment	Q16	1 18-24 2 25-30 3 31-39 4 40-49	5 50-59 6 60 and above 7 Mix of different ages
V21 Number of employees	Q17	1 1 2 2-5 3 6-15 4 16-50	5 51-100 6 101-250 7 More than 250 people 8 Company has closed
V22 Office location	Q18	1 Has or rents its own office 2 Co-working resident 3 Business accelerator resident 4 Incubator resident	5 Technological park resident 6 Works on the premises of the parent company (corporation or institution)
V23 Prior participation in acceleration programmes	Q18	1 Yes 2 No	
V24 Sources of financing	Q20	1 Personal and family's/friends' savings 2 Capital of the parent company 3 State research grant 4 Grant (start-up competition winner) 5 Crowdfunding 6 Business angel capital 7 Pre-seed and seed venture capital	8 Venture capital (round A) 9 Venture capital (round B) 10 Equity crowdfunding 11 Bank loan for entrepreneurs 12 Corporate venture funds 13 Cash-out strategy 14 Merger/acquisition 15 IPO 16 Prepaid orders 17 Other
Factual information about respondent (entrepreneur) (Section 1 questions)			
V25 Entrepreneurial experience	Q11	1 Yes 2 No	
V26 Gender	Q1	1 Female 2 Male	

Appendix 3.3. Summary of data

№	Company name	Company profile	Respondent name	Business sector	Market type	Age of the company/project - NIS development phase	Business aim	Type of innovation	SME innovativeness category	Registered patents	Stage of project development by the interview date	Perceived overall business success of a company	Conformity of the expectations/plans with the results	Prior education of founders					Prior entrepreneurial background of the founders	Ages of the key founders at the time of founding	Number of employees	Location of the office	Prior participation in the acceleration programmes	Sources of financing	Prior entrepreneurial experience	Gender
														Technical	Business, management or economics	Liberal arts (but not management or economics)	Creative studies	Other								
№	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14	V15	V16	V17	V18	V19	V20	V21	V22	V23	V24	V25	V26
	Q2	Q4	Q1	Q4	Q6	Q9	Q10	Q23	Q10, 23, 25	Q23	Q12	Q26	Q27, 27, 29	Q14					Q15	Q16	Q17	Q18	Q18	Q20	Q11	Q1
1	Crystal	Hotel	Vladimir	2	1	5	2	4	4	2	13	2	1	1	2	2	2	2	1	7	3	1	2	1	1	2
2	L'azur	Perfume store	Vyacheslav	5	1	4	2	4	4	2	12	1	1	2	2	1	2	2	1	1	2	1	2	1	2	2
3	Transport Alliance	Transportation services	Elena	4	2	4	2	4	4	2	13	2	1	1	2	2	2	2	1	7	5	1	2	1	2	1
4	Smoke Empire	Hookah salon	Timur	2	1	5	2	1	4	2	12	2	4	2	2	1	2	2	1	1	2	1	2	1	2	2
5	Mirko	Processing of meat or poultry	Andrey	1	2	4	2	1	4	2	14	1	2	1	2	1	2	2	1	4	4	1	2	1	1	2
6	Anin	Beauty salon	Mariam	2	1	5	2	4	4	2	14	1	1	2	2	1	2	2	1	1	4	1	2	1	2	1
7	Relax	Hotel	Daniel	2	1	5	2	4	4	2	13	1	1	1	2	2	2	2	1	4	4	1	2	1	2	2
8	Loft	Hookah salon	Robert	2	1	5	2	1	4	2	12	1	1	2	1	2	2	2	1	1	5	1	2	1	1	2
9	Nail Sunny	Beauty salon	Eleonora	2	1	4	2	4	4	2	13	1	2	2	2	1	2	2	1	1	7	1	2	1	2	1
10	Baylo	Goods for dancers	Tatiana	5	1	4	2	1	4	2	12	2	2	2	2	1	2	2	1	5	2	1	2	1	2	1
11	City Dental Center	Dental care	Irina	2	1	4	2	1	4	2	13	1	1	2	2	2	2	1	2	7	4	1	2	1	2	1

№	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14	V15	V16	V17	V18	V19	V20	V21	V22	V23	V24	V25	V26
12	ASK-Capital	Legal and accounting services for entrepreneurs	Svetlana	4	2	4	2	4	4	2	13	1	1	2	1	1	2	2	2	1	3	1	2	1	2	1
13	Bouquet-77	Flower shop	Vladislav	5	1	5	2	1	4	2	12	1	1	2	1	2	2	2	1	1	3	1	2	1	1	2
14	Branding	Production of apparel	Olga	1	1	4	2	1	4	2	12	1	1	2	1	2	1	2	2	1	3	1	2	1	2	1
15	Dialog Construction	Construction services	Kirill	4	2,3	4	2	4	4	2	13	2	2	1	2	2	2	2	1	2	5	1	2	6	1	2
16	Iris	Flower shop	Artem	5	1	4	2	1	4	2	13	1	2	2	1	2	2	2	2	1	5	1	2	1,11	2	2
17	Kefir-Baton	Grocery store	Natalia	5	1	5	2	4	4	2	11	1	2	1	1	2	2	2	1	3	3	1	2	1	1	1
18	LKC-Advertising	Digital marketing	Anton	3	2	4	2	3	3	2	13	1	2	1	2	2	2	2	2	1	2	1	2	1	2	2
19	Sweatshirt	Production of apparel	Anna	1	1	5	2	1	4	2	12	1	2	2	1	2	2	2	2	1	2	1	2	1	2	1
20	WedStory	Event agency	Ekatetrina	2	1	5	2	1	4	2	12	2	2	2	1	2	2	2	2	1	2	1	2	1	2	1
21	SV Group	Production of apparel	Alena	1	2	4	2	4	4	2	14	2	3	2	2	1	1	2	2	7	3	1	2	1,6	1	1
22	Target Marketing	Digital marketing	Allan	3	2	5	1	3	3	2	15	1	4	2	1	2	2	2	1	1	3	1	2	1	1	2
23	TexPo	Production of outdoor billboards	Igor	1	2	4	1	3	3	2	13	2	1	1	2	2	2	2	1	4	4	1	2	1	1	2
24	Dial-Electro	Production of lighting equipment	Pavel	1	2	5	1	3	3	2	14	1	3	1	2	2	2	2	1	4	2	1	2	1	1	2
25	Concept Logistic Group	Logistics services	Denis	4	2	4	2	3	3	2	14	1	1	1	1	2	2	2	1	3	4	1	2	1,11,16	1	2
26	Orthodox Pilgrim	Journal	Alena	2	1	4	2	3	3	2	13	2	2	2	2	1	2	2	2	3	3	6	2	1,2	2	1
27	Myst Distro	Distribution of liquid for electronic cigarettes	Vladimir	1	2	5	2	3	3	2	11	4	3	2	1	2	2	2	1	2	4	1	2	1	1	2
28	Resharium	Educational services	Alena	2	1	5	2	3	3	2	7	1	1	1	2	1	1	1	1	2	4	1	2	1, 11	1	1
29	OG Spinners	Production of spinners	Gleb	1	1	5	2	3	3	2	11	1	3	1	1	2	2	2	2	1	2	1	2	1	2	2
30	Lary	Beauty salon	Larisa	2	1	4	2	3	3	2	13	2	2	1	2	2	2	2	2	4	5	1	2	1	2	1
31	I love Dora	Production of jewelery	Dmitry	1	1	5	2	3	3	2	12	2	3	2	1	2	2	2	2	1	8	1	2	1	2	2

№	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14	V15	V16	V17	V18	V19	V20	V21	V22	V23	V24	V25	V26
32	Language profi	Tourism, Educational services	Olga	2	1	4	2	3	3	2	12	1	3	1	2	2	2	2	2	3	2	1	2	1	2	1
33	Create Develop	Co-working	Karen	4	2	5	2	3	3	2	12	4	2	2	1	1	2	2	2	1	3	1	2	1	2	2
34	Avto-Okey	Auto parts trade	Andrey	5	1	4	2	3	3	2	13	2	3	1	1	2	2	2	1	5	6	1	2	1,2	1	2
35	Second Breath	Digital marketing	Vladimir	3	2	4	2	3	3	2	14	2	3	2	1	2	2	2	2	2	4	2	2	1	2	2
36	Frushh	Production of fruit drinks	Valerii	1	2	5	2	3	3	2	11	1	2	2	1	2	2	2	1	1	2	1	2	1	1	2
37	Reshego	Educational services	Sergey	2	1	5	2	3	3	2	11	2	2	1	2	2	2	2	1	1	2	1	2	1	1	2
38	Agropromholod	Production of refrigerators for food processing plants	Andrey	1	2	4	1	5,7	2	2	14	1	1	2	2	1	2	2	1	4	4	1	2	1,16	1	2
39	Finansisto	IT solution for monitoring personal finances	Mikhail	3	1	4	3	3,5	2	2	6	2	3	1	2	2	2	2	1	2	2	2	2	1	1	2
40	Football Platform	IT solution for football professionals	Daniel	3	1	5	3	6	2	1	5	1	3	1	2	2	2	2	1	1	3	1	2	1	1	2
41	IE Afonin	Development of corporate software	Anton	3	2	5	3	5	2	2	11	2	3	2	1	1	2	2	1	1	2	1	2	1,16	1	2
42	KS Engineering	Production of metal costructions	Alexey	1	2	4	3	5	2	1	13	1	3	1	2	2	2	2	1	4	4	1	2	1	1	2
43	Marmo Bagno	Production of sanitary ware from marble powder	David	1	2	4	1	5,7	2	1	14	1	3	1	2	1	2	2	1	4	4	1	2	1	1	2
44	Softvelum	IT solution for effective video information transmission	Maxim	3	2	4	1	5,6	2	2	13	1	1	1	2	2	2	2	2	2	3	2	2	1,16	2	2

№	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14	V15	V16	V17	V18	V19	V20	V21	V22	V23	V24	V25	V26
45	Vezdehod	Production of footwear for fishermen	Yuri	1	2	4	1	5,7	2	1	13	1	3	1	2	2	2	2	1	7	4	1	2	1	1	2
46	Vim Digital	Development of video games	Vladimir	3	2	4	3	6	2	2	14	2	2	2	1	2	2	2	2	1	3	1	2	1	2	2
47	Robotechnics	Production of robots for dismantling of buildings	Alexey	1	2	5	3	5,7	2	1	11	1	3	1	2	2	2	2	1	3	3	1	2	1	1	2
48	Unicorn	Production of liquids for electronic evaporators	Mikhail	1	2	5	1	5,7	2	1	11	1	2	1	2	1	2	2	2	1	3	1	2	1, 6	2	2
49	Codabra	Educational services	Arthur	2	1	5	1	5,7	2	2	11	1	1	1	2	2	2	2	2	4	5		2	1	2	2
50	Motorika	Production of functional hand prosthesis and rehabilitation programme	Andrey	1	1	5	3	3,5,7	1	1	13	1	3	1	2	2	2	2	1	7	4	5	1	1,3,5,6,7	1	2
51	Mereya Cosmetics	Production of cosmetic for epilation and trainig programmes	Dmitry	1	1,2	5	1	2,7	1	1	10	1	3	1	1	2	2	2	1	5	3	5	1	1,2,4,6,7	1	2
52	Directual	IT solutions for business process automation	Arthur	3	2	5	3	3,5,6	1	1	13	1	3	1	2	2	2	2	1	2	4	2	2	1,4,6	1	2
53	Global Center of Engineering Services	Production of industrial refrigeration systems	Artem	1	2	5	3	2,7	1	1	10	1	3	1	2	2	1	2	1	3	2	6	2	1,2,3,6	1	2
54	Giftery	Corporate electronic gift certificates	Evgenii	3	2	4	3	3,5,6	1	2	13	1	2	1	1	2	2	2	1	3	4	5	1	1,4,6	1	2
55	Oculus Rift	Production of virtual reality glasses	Alexey	1	1	4	1	2,4	1	1	13	1	3	1	1	2	2	2	1	2	5	1	2	1,5,6,7	1	2

№	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14	V15	V16	V17	V18	V19	V20	V21	V22	V23	V24	V25	V26
56	MasterSlavl	Educational services	Andrey	2	1	5	3	3,5,7	1	1	14	1	3	1	1	2	2	2	1	7	6	1	2	1,6,11	1	2
57	Animo	Production of smart pet feeder: automatic feeder controlled by mobile application	Vladislav	1	1	5	3	3,5,6	1	1	10	1	3	1	2	2	2	2	1	3	3	5	1	1,5,6	1	2
58	SunProtein	Production of protein from sunflower seeds	Sergei	1	1,2	5	3	3,5,7	1	1	11	1	3	1	1	1	2	2	1	3	5	6	1	1,2,6,7	1	2
59	ElStato	Production of electric motors of fundamentally new type	Evgeniy	1	2	4	1	2	1	1	5	2	3	1	2	2	2	2	2	7	3	1	1	1	2	2

Excluded Data

№	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14	V15	V16	V17	V18	V19	V20	V21	V22	V23	V24	V25	V26
1	WoodStory	Production of tailor-made furniture	Alexey	1	1	1	2	1	4	2	13	2	1	1	2	2	2	2	1	2	4	1	2	1	1	2
2	Dolce Vita Group	Tourism	Oksana	2	1	2	2	1	4	2	13	1	1	2	1	1	2	2	1	4	3	1	2	1	1	1
3	FiTEX	Production of textile haberdashery	Alexander	1	2	1	2	4	4	2	14	1	1	1	2	1	2	2	1	7	6	1	2	1	1	2
4	ZooConstruction	Construction services	Mamikon	4	2,3	2	2	1	4	2	13	2	2	1	2	2	2	2	1	4	4	1	2	1	1	2
5	Russian Racing Group	Organization of sporting events	Iliya	4	2	3	2	3	3	2	14	1	2	1	1	2	2	2	1	4	4	1	2	1	1	2
6	Ginger Trading	Production of apparel	Irina	1	1	1	2	3	3	2	14	1	3	2	1	2	2	2	2	1	7	1	2	1	2	1
7	Amova Jewelry	Production of jewelery	Svetlana	1	1	2	2	3	3	2	14	1	3	2	2	2	1	2	1	1	4	1	2	1	1	1

Appendix 4.1. Practice-oriented educational project that brings Lomonosov Moscow State University Business School bachelor students and innovative start-ups together to develop a systematic approach to building networks conducive to innovation

10 February - 27 April 2018, Moscow, Russia

Description of the work in each stage of the project

Students were tasked to maintain a constant connection with the start-up, adjust and modify the composition of the work at each stage so that it best addresses the challenges facing the start-up.

Stage	Timing	Assignment for students
Stage 1. The study of theory	***10-25 February***	▪ Study the course materials on the following topics. – **Innovative start-up**: The notion of an innovative start-up; the trajectory of its development (viewed from the start-up's side, the venture capitalist's side and the market side), the tasks solved by start-ups at different stages of their development, legal aspects of technological entrepreneurship, management of the process of commercialising ideas and technologies, the role and tasks of customer development (CusDev) as a tool for assessing customer needs in the target segment (problem-definition phase) and for testing hypotheses regarding the value of a specific product/service for the client segment (solution-validation phase). – **Building network relationships in business:** Contemporary views on entrepreneurs' networks (concept of networking; types of networks; benefits, opportunities, costs and risks of the formation and governance of relations; role of social capital; role of trust and its mechanisms; evolution of the role of social networking in the Russian context; soft skills required for establishing relations in business; systematic approach to organisation of participation in the exhibition/professional fair (the contents of the stages before, during and after the event). – **The concept of an innovation system:** Concepts and models of national and regional innovation systems as the context of innovation, and the construction of relations conducive for innovation; key groups of NIS actors, their motivations and interests; opportunities provided by innovative systems to innovative start-ups. – **Characteristics of the innovative system of Russia and Moscow:** The evolution of the system, key players, the National Technology Initiative, existing projects to support innovative entrepreneurship, systemic problems of developing innovative Russian systems and ways to overcome them.
Stage 2. Preparatory work	***26 February - 4 March***	▪ Attend a workshop with start-ups in Skolkovo (26 February 2018), choose a start-up with which to work on the project. ▪ Study the materials presented by the chosen start-up, create an understanding of the features of the start-up's product/service, determine the stage of business-project development. ▪ Identify the start-up's priorities along the path to commercialisation of its product and map the groups of actors who can help solve these tasks. ▪ Form the goals of establishing contacts, identify sources of potential contacts.

		▪ Determine which of the identified groups of actors will participate in the Batimat Russia professional fair (3-6 April 2018). ▪ Determine which of the identified groups of actors should be invited to visit the start-up's stand at the exhibition (e.g., potential clients and partners). ▪ Develop the value proposition for the start-up's cooperation with key groups of actors from the perspective of the start-up itself and the perspective of potential participants in the relationships. ▪ Consider the parameters of customer segmentation, identify and analyse existing segments (including the market potential of each segment for the product/service), select one (or two) of the most promising customer segments and explain the rationale for doing so, develop a client profile for this segment. ▪ Synthesise the results of this stage in a PowerPoint presentation and present to classmates in class.
Stage 3. Coordination of activities with start-ups	***5-13 March***	▪ Hold a meeting with representatives of the start-up to: – Clarify questions regarding the characteristics of the product/service. – Discuss the list of tasks the start-up needs to complete to achieve commercialisation and the map of NIS actors able to help with these activities. – Select the groups of actors with whom, in opinion of the start-up, relations should be established through participation in the Batimat Russia professional fair. – Examine the feasibility of the chosen target segment – customer development will focus on this target segment. – Understand the hypotheses that the start-up wishes to test in relation to the target segment in the framework of customer development. – Clarify the start-up's expectations for the work performed by the student team in each stage of the project, including at the professional fair (clearly state the value that should be created for the start-up at each stage and the anticipated outcome). – Develop an action plan for all stages. ▪ Synthesise the results of the discussion with the start-up and present an agreed action plan to classmates in class.
Stage 4. Preparation for participation in the exhibition	***14 March - 3 April***	▪ Implement the action plan, which should include: – Assisting the start-up in establishing preliminary contacts with selected groups of NIS actors, writing invitations and preparing documents for meetings. – Preparing for participation in the professional fair with regards to interactions with customers: • Conduct customer development (problem-definition phase) – at least 12 interviews with representatives of selected client segments. • Develop a text describing the value proposition for the selected segment. • Design information materials (advertising leaflets or videos) in agreement with the company. • Assist with information distribution and send invitations to representatives of the target segment to take part in meetings at the professional fair.

		• Develop a text (teaser) to use in communication with representatives of the target segment at the stand. – Developing data-collection tools to gather information on contacts and their presence during the professional fair. – Developing data-collection tools for competitive analysis during the professional fair. ▪ Communicating while executing assignments and obtain the start-up's approval for: • The materials prepared for the stand. • The templates developed for data collection. • The plan of activities for students during the professional fair. ▪ Synthesise the results of this stage in a PowerPoint presentation and present to classmates in class.
Stage 5. Work at the exhibition	***4-6 April***	**<u>Work at the Batimat-2018 professional fair at the start-up's stand</u>** ▪ Assist at the stand, help conduct meetings with representatives of selected groups of NIS actors. ▪ Organise a system for collecting and storing contact information obtained from stand visitors during the fair. ▪ Gather information as a result of communication with the representatives of the target customer segment (customer development, solution-validation phase). ▪ Collect information on competitors exhibiting at the professional fair; ▪ Collect information on possible synergistic projects the start-up may undertake with representatives of selected groups of actors participating in the professional fair.
Stage 6. Process and analyse collected information	***7-11 April***	▪ Pre-process the materials collected at the exhibition, including creation of a catalogue of potential customers in the selected segment gained as a result of the professional fair; send letters of thanks to stand visitors. ▪ Systematise the information collected on competitors. ▪ Systematise the information collected on the advantages of establishing interactions with key actors met at the professional fair. ▪ Agree on objectives and key issues that the start-up wants covered in the analytical work in the report and presentation.
	13-26 April	▪ Systematise the information, and synthesise answers and solutions to the company's questions. ▪ Process the data and compile the report based on the previously agreed questions (15-20 pages in length). ▪ Prepare a presentation of the results. ▪ Summarise the results in a PowerPoint presentation and present to classmates in class (rehearsal). ▪ Finalise the reporting documents (report + presentation) and prepare to present them to start-ups at the Skolkovo Foundation.
Stage 7. Final defence in Skolkovo	***27 April***	▪ Present the group's work done and the results. ▪ Bring paper (three copies) and electronic copies of the reporting documents (report + presentation) on the day of the defence.